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The Government in the Markets

THE government has committed itself to an initial outlay of $328,000,000 for Tennessee Valley, Boulder Dam and Columbia River projects upon the plea that these will demonstrate that electric customers are paying too much for electric service. We have said that these are unsound economic projects, that this subsidized competition is unfair and unnecessary and that far less money would be tied up in the more logical plan of making government money available to the present electrical industry to develop present markets. But these initial commitments are made and now the government is awake to a fact that has long been known to the industry.

This fact is that the fundamental difficulty confronting the government as well as the electrical industry is to get people to desire more electrical products and more electric service. It is a problem of marketing that necessitates changing human habits and traditional methods. The industry has found that low rates and low-priced products will not sell of themselves. They follow as an economic result of increased business, but will not produce this business unless fully supported by extraordinary efforts to mold public opinion and thus create consumer demand. It takes years to get a community to use electric cooking, for example. It took years and large expenditures to create the present electric refrigeration business. Financing plans, free wiring, trial or rental plans—all these sell a small strata of the market if there is no mass creation of customer demand. These sales devices are most effective after consumer demand has been created and have a negligible influence upon public psychology.

Any one can build plants and lines, but nobody has found a quick and economical way to get people to use electricity abundantly in their homes. In Great Britain a great electrical grid has been built and those in authority find themselves faced with enormously increased capital charges and very little increased revenue. They are forced to go into marketing. The private utilities in this country have at least 25 per cent excess capacity at present and they and other branches of the industry have applied their best efforts to sell this capacity. The markets are available, but they have not been sold.

And so we welcome the new idea of the T. V. A. It is premised upon selling the homes in the Tennessee Valley a great volume of merchandise quickly and economically by the use of government credit. The details of the methods to be used are not yet available, but it is presumed these will follow the usual merchandising distribution channels, with no significant changes in prices or margins. But we do not believe that the use of credit alone will do the work. If the T. V. A. authority wishes the people to use electricity abundantly in this region it must create a desire to use electricity as well as to make electrical service and products available. The creation of consumer demand is expensive, diffi-

cult and time consuming, but this must be done before sales can be made.

We hope, therefore, that the T. V. A. authority is well advised as to the problems involved in electrical marketing and is not led astray by incomplete plans that fail to take into consideration the fundamental problem that has always handicapped the growth of the domestic electrical business—the creation of a desire to buy and to use electrical products and services.

Kitchen thinking—And the next step

Last week the dedication of a General Electric Institute in Cleveland marked a new phase that has come in selling by the electrical industry. It added to the former Lighting Institute an elaborate display of electrified kitchens and thereby gave recognition to the fact that today interest centers in the kitchen. For model electric kitchens have already been installed in many cities by power companies, manufacturers, department stores, newspapers. Ranges, water heaters, refrigerators, dishwashers, mixers are now being sold around this central idea.

Eight years ago it was that this idea was first actively promoted. The industry was urged to sell the home not one appliance at a time, but a complete equipment, financed in old homes under a single long-term contract and in new homes under the building mortgage. It has taken eight years, therefore, to change the thinking of the industry from product selling to this broader concept embracing an entire room. For men's minds move slowly. This is progress, however, because John and Mary are naturally more interested in their kitchen than in our products, and this new approach is stimulating the purchases of all those appliances that are used in the kitchen.

But if it takes eight years to win the acceptance of electrical men for such a simple idea, we should begin now to sow the seeds of the next step in this evolution of sales policy. For the kitchen does not embrace air conditioning, nor the scope of domestic lighting, nor the laundering of clothes, nor the general use of electricity for heat and power in the home. And John and Mary are interested in more than just one room. They are concerned with their daily living in their house. And it is around the daily needs, habits and problems of their family that our selling should be organized.

In a word, electrical men should stop thinking only about products, or even about rooms, and begin to focus their plans on the family—and what it needs and wants. It will be a harder step than the transition to kitchen thinking. But kitchen thinking will delay the sale of both illumination and air conditioning, if this is made just another four-year fad and if we fail to see that it is but a step—an intelligent step—toward an even greater objective. The kitchen idea should be promoted and developed. It is splendid selling. But lighting, laundering and air conditioning offer a great market too and should have their place in this broader approach to the family.

Just a St. Lawrence complex

Montreal has not been the least bit enthusiastic about the prospective St. Lawrence waterway-power development because that might divert a lot of its sea trade. It finds now that it has something far more serious to contend with, something that is physical and immediate rather than remote and political. The 35-foot channel to the sea is nearing completion and Montreal is startled by the steadily lowered level of its harbor waters. It appears that making a channel deep enough for ocean vessels also makes a channel that carries the river water away faster. This recalls the warning of Sir Alexander Gibb that the problems of the St. Lawrence are "difficult, complicated and far-reaching, and that its control and regulation will involve too many considerations and too heavy expenditures for it to be left in the hands of one department or divided among a number." He might well have added that the division of the problem among international boards would hardly lead to any quicker solution of a severe technical difficulty.

It would be a sad blow to the waterway advocates of the development of the international section to have their desired millions of outlay go to waste because deepened channels to the sea would take more water away and leave no greater depth for the keels. Toying with nature has its limits, because nature's constitution brooks few amendments.

THE WEEK

Light and Power Code Filed With NRA

SOME large measure of the defensive provisions of the proposed NRA code of fair competition for the electric light and power industry having been allegedly lost between St. Louis (ELECTRICAL WORLD, December 9, page 740) and Washington, the National Recovery Administration on December 22 received an amended code from G. B. Cortelyou, president of the Edison Electric Institute and chairman of the Industry Conference, and P. S. Arkwright, chairman of the code committee of the industry.

Public hearing before Deputy Administrator Leighton Peebles will probably begin January 11, 1934. Preliminary labor hearings may begin next week.

Article I—Purpose of the Code

The declared purpose of this Code of Fair Competition for the Electric Light and Power Industry is to effectuate the policies of Title I of the National Industrial Recovery Act and to establish administrative agencies therefor.

Article II—Definitions

The following definitions are adopted for the purpose of this code:

1. The term "industry" means the electric light and power industry, which is defined as the supplying of electric service to others, and includes the generation, transmission, distribution, sale and resale of electric light, power or energy; the promotion, display, servicing, leasing, and sale at retail, by members of the industry, of electrical appliances; the maintenance, repair, design, construction and reconstruction of facilities for use in electric service, where such work relates to an integral part of the system of supply, is done by employees of the industry, and is incident to operation or maintenance or the rendering of service to the public; and the testing and emergency repair of customers' installations for the rendering of continuous service to such customers. For the purposes of this code, the generation, distribution and sale of steam service to others, for heat and/or power, are included in the industry as defined, without further or separate enumeration.

2. The term "member of the industry" means all who are engaged in the industry, either as an employer or on his or its own behalf, and includes any person, partnership, firm, association, trust or corporation engaged in the industry, and includes to the extent of their voluntary participation such federal, state, municipal or other publicly operated plants, enterprises or authorities, engaged in the industry, as specifically obligate themselves to put into effect any or all of the provisions of this code.

3. The term "employee" includes any and all persons employed by members of the industry, however compensated; but for the purposes of provisions covering maximum hours and minimum wages, the term "employee" shall not include members of the industry, officers thereof, professional persons, and persons in executive, managerial or supervisory capacities, with their immediate staffs, who receive more than twice the otherwise applicable minimum rate of pay.

4. The term "employer" means any member of the industry by whom any such employee is compensated or employed.

5. The term "professional person" includes physicians, dentists, nurses, chemists, research technicians, architects, senior accountants, senior statisticians, advertising specialists, lawyers, instructors in technical or educational courses, directors or supervisors of recreational activities, and other persons engaged in occupations involving special education or training and a recognized professional status.

6. The term "part-time employee" means an employee who works during an average week, for a period of time less than the maximum work week specified herein.

7. The term "learner" shall not include any employee who has been employed in that capacity by an employer during more than twelve months.

8. The term "certified public accountant" as herein used shall include any independent accountant having the equivalent in qualifications and ability of a certified public accountant; provided, however, that as to any service to be performed in any State or governmental subdivision of the United States, such accountant shall have in any event the qualifications required by law for the performance of such service, in such state or governmental subdivison of the United States or in the state in which such public accountant has his principal office and place of business.

9. The terms "The President," "Act," and "Administrator" mean respectively the President of the United States, Title I of the National Industrial Recovery Act, and the Administrator for Industrial Recovery.

10. The term "Institute" means the Edison Electric Institute, an existing association composed of members of the industry.

11. Population, for the purposes of this code, shall be determined by reference to the latest federal census.

12. For the purposes of the provisions of this code as to wages and hours of labor, the employees of any member of the industry are divided and grouped as follows:

First Group: Those employed wholly or principally within a city of not less than 500,000 population.

Second Group: Those employed wholly or principally within a city of less than 500,000 population but more than 250,000 population.

Third Group: Those employed wholly or principally within a city of less than 250,000 population but more than 75,000 population.

Fourth Group: Those employed wholly or principally within a city, town or village of less than 75,000 population but more than 2,500 population.

Fifth Group: Those employed wholly or principally within cities, villages and towns or other political subdivisions of 2,500 population or less, together with rural areas and all other areas not included in any of the above groups.

13. The classification of employments within states, as used in Articles III and IV hereof, are defined as follows:

(a) The "Middle Atlantic and East North Central States" include the states of New York, New Jersey, Pennsylvania, Ohio, Indiana, Michigan, Illinois and Wisconsin.

(b) The "New England, West North Central, Rocky Mountain (excepting Arizona and New Mexico) and Pacific States" include the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Montana, Idaho, Wyoming, Colorado, Utah, Nevada, Washington, Oregon and California.

(c) The "South Atlantic, East South Central and West South Central states and Arizona and New Mexico" include the states of Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas and the District of Columbia.

Article III—Hours of Labor

No employee shall work or be permitted to work in excess of the hours prescribed and limited by this article.

(A) General Office Employees	Average Hours Per Week	Averaged Over a Period of
First group ...	40	6 weeks
Second group ..	40	6 weeks
Third group ...	48	6 weeks
Fourth group ..	48	6 weeks
(B) Operating and Other Employees		
First group ...	40	6 weeks
Second group ..	42	6 weeks
Third group ...	48	6 weeks
Fourth group ..	48	6 weeks

(C) **The fifth group:** Within and for the fifth group, no limitation of the average hours of work by an employee is herein fixed, but each employer shall in good faith endeavor to adjust the working hours of employees so as to increase employment and further the purposes of the act; and the Code Authority hereinafter created may make recommendations to that end, to employers within the fifth group. The Administrator shall further have the power, after hearing, upon the recommendation of the Code Authority, to recommend suitable schedules and limitations of hours of labor within the fifth group or as to particular areas therein, provided that the hours so fixed shall not be less than those above provided for the fourth group.

(D) **Special Classes and Provisions:**

1. The maximum hours above limited shall not apply in the following cases:

(a) During the period of emergencies arising from storms, floods, explosions, fires, failure of major units, failure of apparatus necessary for continuous service, epidemics, or other causes beyond the control of the employer or affecting the rendering of adequate and continuous service to the public, there shall be no limitations under this Article as to the hours of work by any employee, and such hours shall not be considered in the computation of average normal hours.

(b) Employees in other than the first and second groups, in offices, stations or substations employing not more than two office employees and/or not more than two operating employees at any one time, exclusive of managers; shift employees where not more than two persons are employed in any one shift; and employees in remote or isolated localities where reliefs are difficult or impracticable.

(c) Employees otherwise subject to a requirement of less than 48 hours per week and comprising emergency maintenance and repair employees, station and substation operators, transmission and distribution operators, and their immediate attendants, crews and helpers, if highly trained and not readily replaceable, and like employees in the rendering of steam service, whose duties must be continuously performed in order to render to the public a safe and continuous service and where other competent employees are not readily available; provided that such employees under this subdivision shall not work in excess of an average of forty-eight hours per week during any six successive weeks; and provided further that the employers shall proceed with the training of additional employees as rapidly as consistent with the rendering of safe and continuous service, so that as rapidly as practicable and before September 15, 1934, its employees may be reclassified under the provisions of Paragraph B of this Article, and shall report to the Administrator and the Code Authority not later than March 15, 1934, and again not later than August 15, 1934, the extent to which such reclassification has taken place; and provided further that, for cause shown, the Code Authority may extend such time for reclassification beyond September 15, 1934, as to any group, area, or member of the Industry.

(d) Outside salesmen, demonstrators, outside collectors, right-of-way agents, customer service employees, complaint department employees, outside employees working wholly on commission, emergency crews, investigators and other employees whose hours of work are irregular and/or non-consecutive, whose occupations involve calling at customers' premises or travelling outside of the community in which such employee's office headquarters is located.

2. In the following classes of cases the Code Authority shall have the power, after such notice and public hearing thereon as it may prescribe and subject to the review and the approval, disapproval and/or modification thereof by the Administrator after hearing, to make rules, regulations or orders granting stays or exemptions from the provisions of this Article as to particular groups, areas, or members of the Industry, with or without limitations as to time and without limitation as to additional items or classes:

(a) A small number of employees, not to exceed one in establishments of twenty employees or less and not to exceed 5 per cent of the total number of operating employees in other cases, whose occupations require that they arrive at the job before the main body of employees and/or remain after they have gone, provided that the amount of extra hours so worked shall not exceed 15 per cent of the normal hours for the class of work concerned.

(b) "Worker-pensioners" and handicapped employees, who, by reason of age or infirmities, are not capable of performing arduous or exacting work and who perform only light duties, and watchmen, janitors or cleaners, provided that the number of such employees exempted hereunder shall not exceed 5 per cent of the total number of employees of the employer.

(c) In the case of operations which vary substantially over different periods of the year and are essentially seasonal in character, it may be so determined and directed that the provisions of this article shall be deemed complied with as to any employee if the average number of hours of work per week by such employee during the two periods, January to June, inclusive, and July to December, inclusive, shall fall within the maximum prescribed in this article for employees of that class.

(E) **Employment by Several Employers:** No employer shall knowingly permit any employee to work for any period of time which, when totalled with that already performed within such period for another employer or employers, would exceed the maximum permitted pursuant to this article.

Article IV—Minimum Wages

The public obligation of the industry to render continuous and adequate service involves substantial continuity of employment for operating and office employees. No employee shall be paid less than the rates of pay prescribed by this article:

1. *Employees Paid on Weekly or Monthly Basis:*

Group	Middle Atlantic and East North Central States*	New England West North Central, Rocky Mountain (Excepting Arizona and New Mexico), and Pacific States	South Atlantic, East South Central and West South Central States, and Arizona and New Mexico
	Per Week	Per Week	Per Week
(a) First	$15.00	$15.00	$15.00
(b) Second	14.50	14.50	14.00
(c) Third	14.00	13.00	12.50
(d) Fourth	13.00	12.50	12.00
(e) Fifth	12.00	12.00	12.00

2. **Employees Paid on an Hourly Rate:**

(a) In the Middle Atlantic and East North Central States, 40 cents per hour unless the hourly rate for the same class of work on July 15, 1929, was less than 40 cents per hour, in which latter case the rate of pay shall be not less than the July 15, 1929, hourly rate of pay and in any event shall not be less than 30 cents per hour.

(b) In the New England, West North Central, Rocky Mountain (excepting Arizona and New Mexico) and Pacific States, 40 cents per hour unless the hourly rate for the same class of work on July 15, 1929, was less than 40 cents per hour, in which latter case the rate of pay shall be not less than the July 15, 1929, hourly rate of pay and in any event shall not be less than 30 cents per hour.

(c) In the South Atlantic, East South Central, and West South Central States, Arizona and New Mexico, 40 cents per hour unless the hourly rate for the same class of work on July 15, 1929, was less than 40 cents per hour, in which latter case the rate of pay shall be not less than the July 15, 1929, hourly rate of pay and, in any event, shall not be less than 30 cents per hour.

3. Learners, office boys and girls, and messengers, may be paid not less than 80 per cent of the minimum wage rate provided in this article; but the total number of employees so compensated shall not exceed 5 per cent of the total number of employees of any employer.

4. "Worker-pensioners" and handicapped employees, who by reason of age or infirmities are not capable of performing arduous or exacting work and who perform only light duties, and watchmen, janitors or cleaners, may be paid not less than eighty per cent of the minimum wage rates provided in the above schedule, but the total number of employees thus compensated shall not exceed five per cent of the total number of employees of any employer.

5. Female employees performing the same work as male employees shall receive the same rates of pay as male employees.

6. This article establishes minimum rates of weekly or hourly pay which shall apply, irrespective of whether an employee is actually compensated on a time-rate, piece work or other basis. No employee now employed at a rate in excess of the minimum shall be discharged and re-employed at a lower rate for the purpose of evading this Code. Part-time employees who work in part for others or for themselves in other trades or industries shall not be subject to the

**For definitions of the groups and the States comprising the above classifications, see page 855.*

provisions of this Article; other part-time employees shall be paid at not less than the hourly rates specified in this article for full-time employees in such group. Outside salesmen paid wholly by commissions shall not be governed by the provisions of this article.

Article V—General Labor Provisions

1. No person under sixteen years of age shall be employed in the industry; except that the Administrator may, upon recommendation of the Code Authority or otherwise, determine and authorize that, within particular groups or areas or generally within the industry, persons between fourteen and sixteen years of age may be employed for not to exceed three hours per day and those hours between 7 a.m. and 7 p.m. in such work and at such times as will not interfere with attendance at day school. No person under eighteen years of age shall be employed in operations or occupations that have been determined by the Administrator to be hazardous in nature or dangerous to health to persons of such an age. The Code Authority shall, before October 1, 1934, submit to the Administrator a list of such operations or occupations.

2. As required by the act, the following conditions are incorporated in this Code:

(a) Employees shall have the right to organize and bargain collectively through representatives of their own choosing and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or mutual aid or protection.

(b) No employee and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing or assisting a labor organization of his own choosing.

(c) Employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President.

3. Where any member of the industry employs labor also in another industry or trade, the provisions of this Code shall apply to and govern only that part of such member's operations and employments as are within the definition of this industry. If the occupational duties of an employee bring him within more than one class indicated in Articles III and IV, such employee shall, for the purposes of the application of this Code, be deemed to be in that class in which his principal duties are usually performed. If question arises as to the group or class within which a particular employee or employees are to be included for the purposes of Articles III and IV hereof, such question shall be determined by the Code Authority, subject to review by the Administrator.

4. No employer shall reclassify employees or duties of occupations performed by employees for the purpose of defeating the provisions of the act or of this code.

5. Every employer shall provide, reasonably and according to law, for the safety and health of his employees, at the places and during the hours of their employment. Within each state, this code shall not supersede any existing laws/or administrative regulations having the force of laws of such state, imposing more stringent requirements upon employers by way of regulation of the minimum age of employees, minimum wages, maximum hours of work, or as to insurance, health, safety, sanitary, fire protection, or general working conditions, than are prescribed under this code.

6. Within 30 days after the taking effect of this code, each member of the industry shall post a complete copy of this code in conspicuous places available to employees, and shall keep a complete copy of this code in its general office and open to examination by any employee upon request within usual office hours.

Article VI—Organization of the Code Authority

1. Pursuant to Title I of the act, a Code Authority is hereby constituted, as the agency to cooperate and act in the administration of this code, subject in all respects to the right of the Administrator, after hearing, to review and to approve, disapprove or modify any decision or action taken by the Code Authority hereunder.

2. Subject to the provisions of Section 12 of this Article, the Code Authority shall consist of twelve members or such greater number as may be proposed by the Code Authority and approved by the Administrator.

3. The members of the Code Authority shall be apportioned among, and chosen from and by, the members of the Industry as follows:

(a) Members representative of the members of the Industry who are members of the Institute;

(b) Members representative of the privately owned and operated enterprises which are members of the Industry but are not members of the Institute; and

(c) Members representative of members of the industry which are owned and/or operated by municipalities or other State or Federal agencies or authorities and shall have subscribed to this Code.

The members of the Code Authority shall be apportioned among and chosen from the three classes above set forth, on the basis of the ratio which the total number of kilowatt hours sold during the preceding calendar year by the members of the industry within the class is ascertained to bear to the total number of kilowatt hours sold by all members of the industry during such year, excluding in each instance sales between members of the industry in the same class. The number of kilowatt-hours sold by the respective classes of the industry entitled to select members of the Code Authority, and the number of members to be selected from and by each class of the industry, and the disposition to be made of fractional ratios, shall for all purposes under this code, be ascertained and reported to the Administrator by the Code Authority subject to approval or correction for cause shown. For the purposes of the first selection of members of the Code Authority, such ascertainment and determination shall be made by the Administrator. Each of the three classes above specified shall be entitled to at least one representative in the membership of the Code Authority.

4. In addition to the membership above provided, there may be not more than three members as public representatives, without vote, to be appointed by the Administrator, to serve without expense to the industry.

5. The Institute shall select, in such equitable manner as it shall determine, the members of the Code Authority who shall be representative of the members of the Industry who are members of the Institute.

6. Each of the class of enterprises publicly owned and the class of enterprises privately owned but not members of the Institute may organize and select its representatives in such manner as it may determine. If any class fails to select its representatives within sixty days from the taking effect of this Code, such representatives for and from such class may be appointed by the Administrator, upon the nomination of the members of the Code Authority or otherwise, as he may determine.

7. The terms of office of all members of the Code Authority shall be for a period of one year, beginning on July first. Vacancies at any time arising in any class of membership in the Code Authority shall be filled for the unexpired term, in the manner hereinabove provided for members of that class. The selections of members of the Code Authority to represent the three classes of members of the industry and to serve until July 1, 1934, shall be made by those classes within twenty days from and after the effective date of this code. Pending the selection of at least a quorum of the Code Authority as herein provided, the Code Committee, appointed by the Industry to present this code, is hereby constituted the Code Authority during such interim, and a majority thereof shall constitute a quorum.

8. The Code Authority shall, at its first meeting after July first in each year, select from among its members a chairman, who shall be the chief administrative officer of the Code Authority, a Secretary, who shall be the custodian of all records, reports and statistics received from members of the industry, and such other officers as may be provided for in its by-laws, to perform such duties as may be provided in its by-laws. Meetings of the Code Authority may be called at any time by the chairman, and shall be called upon the request of the Administrator or the written request of eight members. All members of the Code Authority, as well as the Administrator, shall be entitled to notice of all meetings of the Code Authority, and may attend and take part in its meetings. A majority of the members of the Code Authority entitled to a vote therein shall constitute a quorum. In all respects not inconsistent with law and the provisions of this code, the organization, selection, meetings, procedure, and ad-

ministration of the Code Authority shall be determined by by-laws, rules and regulations made by the Code Authority subject to review by the Administrator.

9. The Code Authority is empowered to create, from any of its membership, regional committees or sub-authorities, each of which shall be headed by a vice-chairman of the Code Authority and shall be entitled, within its territory, to meet and act for the Code Authority hereunder, subject in all respects to the approval of the Code Authority and review by the Administrator as herein provided. At least one of the public representatives shall be a member of each regional committee or sub-authority. No such plan for regional committees or sub-authorities of the Code Authority shall be effective until it has been submitted to the Administrator and approved by him.

10. In the exercise of all powers and duties vested in the Code Authority under this code, each member thereof shall be fair, impartial, and just.

11. The Institute and each industry association directly or indirectly participating in the selection or activities of the Code Authority shall impose no inequitable restrictions on membership, and shall submit to the Administrator true copies of its articles of association, by-laws, regulations, and any amendments when made thereto, together with such other information as to membership, organization, and activities of the Institute and each industry association as the Administrator may deem necessary to effectuate the purposes of the act.

12. In order that the Code Authority shall at all times be truly representative of the industry on the basis herein provided and shall in other respects comply with the provisions of the act, the Administrator may provide such hearings as he may deem proper; and thereafter, if upon such hearing it shall appear that the Code Authority is not truly representative of the industry on the basis herein provided and/or does not in other respects comply with the provisions of the act, he may require an appropriate modification in the method of selection of the Code Authority or any Sub-Code Authority or other agency hereunder.

13. A member of the industry shall be entitled to participate in the selection of the members of the Code Authority and to participate in proceedings under this Code, during such time as such member in good faith complies with the requirements of this code and further pays promptly its reasonable share of the expenses of its administration. Such reasonable share of the expenses of administration shall be determined by the Code Authority, on the basis of kilowatt hours of electrical energy sold and/or such other factors as may be deemed equitable.

14. Nothing contained in this code shall constitute the members of the Code Authority partners for any purpose; nor shall any member of the Code Authority be liable in any manner to anyone for any act of any other member, officer, agent or employee of the Code Authority or be liable to any one for any action or omission to act under the code, except for his own wilful misfeasance or nonfeasance.

Article VII—Duties and Powers of Code Authority

Subject in each instance to the right of the Administrator, after hearing, to review and to approve, disapprove and/or modify any decision or action taken by the Code Authority hereunder, the Code Authority shall have the following powers and duties, in addition to those provided elsewhere in this code and in the act:

1. To adopt, and from time to time to amend, by-laws, and rules and regulations for its organization and procedure and for the administration and enforcement of this code, in accordance with the powers herein granted, and to submit the same to the Administrator, together with true copies of any amendments or additions when made thereto, minutes of its meetings when held, and such other information as to the activities of the Code Authority as the Administrator may deem necessary to effectuate the purposes of the Act.

2. To make such investigations, conduct such hearings, and make such recommendations to the Administrator, or to the Regional Labor Board or Compliance Board having jurisdiction as to matters within Articles III, IV, and V hereof, as the Code Authority may deem necessary or proper for the enforcement of this code.

3. To receive complains of violations of this code from any member of the industry, employee, or person with an interest in the industry, as to any matter affected by the provisions of this code; to make investigations thereof, provide hearings thereon, adjust such complaints where practicable and consistent with this code, and to bring to the attention of the Administrator its recommendations and information relative to unadjusted violations; provided (a) that in no event shall the Code Authority take any steps as to prosecution without recommendation to and approval by the Administrator; (b) that nothing contained in this Code shall be held to grant to the Code Authority any power, duty or jurisdiction inconsistent with any of the powers, duties or jurisdictions of the regulatory boards or officers of any state, now or hereafter in effect, and the provisions of this code are expressly made in all respects subject to those regulatory powers, duties and jurisdictions of state boards and officers; and (c) that the provisions granted to the Code Authority by this article shall be without prejudice to the powers and duties of the Regional Labor Boards and the National Labor Board in relation to the matters embraced in Articles III, IV and V of this code.

4. To secure an equitable and proportionate payment of the expenses of maintaining the Code Authority and its activities authorized by this code.

5. To initiate, consider and make recommendations for the modification or amendment of this code.

6. To co-operate with the Administrator in regulating the use of the NRA Code insignia by members of the industry.

7. To confer and act jointly with any other Code Authority when and as authorized by the Administrator; to coordinate the administration of this code with such other codes, if any, as may be related to or affect the industry or any part thereof; to confer and co-operate with other agencies, authorities and departments of federal and state governments to effectuate the policy of the act and the provisions of this code; to transmit pertinent information and recommendations to that end; and to delegate to any other administrative authority, upon the approval of the Administrator first obtained, such powers hereunder as will promote co-operative action and fair trade and competitive practices as to matters of common interest in relation to the industry.

8. In order to keep the Administrator informed as to the administration and enforcement of this code, to obtain from each employer, at such times and in such manner as the Code Authority may prescribe, statistics covering the number of persons employed, the wage rates, the amounts of compensation paid to employees, the hours of work, the number of employees excepted from the provisions of this code, and the reasons therefor, and such further data or information as the Code Authority or the Administrator may from time to time require, as to the operations and effects of this code, and to transmit the same for the information of the Administrator and any other departments or agencies of federal or state governments. To the extent that the Code Authority may deem that any information furnished to it by any member of the industry in accordance with the provisions of the code is of a confidential character in the interest of such member and that the publication is not necessary in order to effectuate the policy of Title I of the act, such information shall be treated as confidential, by the Code Authority and all members thereof, and by the members of the industry, if any knowledge of it shall have come to them; and without the consent of such member of the industry, no publication thereof to any one or in any manner shall be made, other than in combination with similar information furnished by other members of the industry, in which case publication will be made only in such manner as will avoid the disclosing separately of such confidential information. Summaries or compilations in reasonable detail of all information furnished to the Code Authority pursuant to this code shall be made periodically and sent to the Administrator. The Code Authority shall not require or transmit any information regarding the names of customers, stockholders or employees of members of the industry. Any and all information furnished to the Code Authority by any member of the industry shall be subject to checking for verification by an examination of the pertinent books, accounts and records of such member by an accountant designated by the Code Authority, and shall be so checked if the Code Authority shall require it. The cost of such examination shall be treated as an expense of administering the code. In addition to the information required to be submitted to

the Code Authority, there shall be furnished to such federal and state agencies as the Administrator may designate such statistical information as the Administrator may deem necessary for the purposes set forth in Section 3(a) of the act.

9. The Code Authority may recommend, and assist in the securing of, stay orders and exemptions, wholly or in part, from provisions of this code, where, for reasons sufficiently appearing to the Code Authority subject to review by the Administrator, any member of the industry is not financially able to undertake or continue compliance with any requirement of this code as to minimum wages or maximum hours.

10. The Code Authority shall designate seven persons from among its members to serve on a co-ordination committee, with a like number of persons designated as hereinafter provided to represent publicly-operated enterprises in the industry. The President is requested to invite the representatives of all of the publicly-operated enterprises in the industry, including federal, state, and municipal, to participate in a conference to be held in Washington at the earliest convenient date, for the purpose of

(a) Co-operating in the establishment and maintenance of desirable standards of industrial relations and fair competition in the industry; and

(b) Naming seven persons as truly representative of such publicly-operated enterprises, to serve on the co-ordination committee.

When such co-ordination committee has been established as hereinabove provided, it shall undertake an investigation and report upon the electric power resources and requirements of the United States, the object of which shall be to project a ten-year plan for the efficient and economical utilization of such resources in the interest of all the people. The co-ordination committee shall also undertake to make recommendations of such policies and programs for the development and operation of enterprises in the industry as will effectuate the policy of the act. The co-ordination committee shall select from among its members a chairman and a secretary, and shall determine its own procedure. Whenever, in Articles III, IV and V hereof, reference is made to the Code Authority, such reference shall be understood to mean the co-ordination committee, in any application of the provisions of those articles to publicly-operated enterprises which are members of the industry.

Article VIII—Fair Competition and Other Policies of the Act

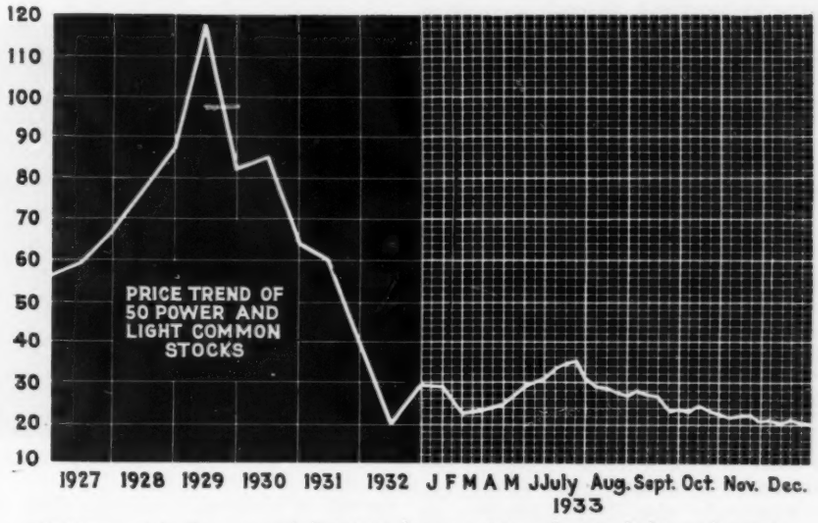
(A) It is of the essence of the code and of fair trade practice that all engaged in the industry shall comply with the provisions of the code and conform to the policy of the act. Compliance with the provisions of the act and this code by members of the industry is declared to be required by fair competitive practice; and violation of the provisions of this code, by any member of the industry, directly or through any manner of subterfuge or evasion, is declared to be contrary to fair trade practice and contrary to fair competition, and so contrary to the act. Any member of the industry which shall directly or indirectly, through any officer, agent, employee or representative, knowingly use or employ any practice contrary to the provisions of this code, shall be guilty of a violation of the code.

(B) It is the duty of members of the industry to promote the use of electric service in the public interest, and to that end electrical appliances are promoted, sold or otherwise made available to customers. It being likewise in the public interest that stores and dealers shall sell electrical appliances, the retail sale and leasing of such appliances shall be conducted according to the standards of fair competition and fair trade practices declared in the Retail Code approved October 30, 1933, and any effective amendments thereof, as applicable to the sale of electrical appliances. If controversy shall arise as to the fair trade practices to be observed in and in connection with the sale of electrical appliances, the same shall be determined by joint action of the National Retail Trade Council and the Code Authority created hereunder, or by the action of the Administrator upon the recommendation of both or either the National Retail Trade Council and the Code Authority. Members of the industry shall co-operate with the local Retail Trade Councils and with the Regional Advisory Committees, in the adjustment of controversies respecting the sale or leasing of electrical appliances.

(C) Fair trade and the policy of the act require that all persons and corporations engaged in the electric light and power business as defined, whether as individuals, private corporations, municipal or quasi-public corporations, or other governmental agencies, or authorities, in competition with others engaged therein, should be subject to the same, or to substantially the same, terms and conditions as to maximum hours of labor, minimum wages, conditions of employment, general labor provisions, and industry practices; and that where a member of the industry is subjected to competition therein by a plant or enterprise which is not conforming to such requirements of this code, such member of the industry shall, on application to the Code Authority approved by the Administrator, be equitably exempted from the operation of this code within the groups or areas affected by such competition.

(D) In order to insure accurate data as the basis for determining fair trade practices and fair competition under the act, as well as for reports and recommendations under this code, it is further declared to be required by fair trade practice that independent firms of certified public accountants shall audit the books and accounts of members of the industry in respect to operations and activities within the industry, and that the annual financial statements by members of the industry, including balance sheets and earnings statements showing gross and net income, operating expenses, and like information of a statistical character, shall be upon the certificate of such accountants; provided that, upon a showing of the financial inability of a member of the industry to defray the cost of such an independent audit of its books and accounts, the Code Authority is authorized to waive such requirement during a period to be fixed by the Code Authority. Fair trade practice is declared to require further that all statements and data furnished by members of the industry to customers, stock exchanges and stockholders, all information designed for dissemination to the public, and all reports to governmental authorities by members of the industry, shall be accurate and shall clearly indicate their source. The Code Authority shall have power from time to time to transmit information and to make

Utility Shares at Year's Low



Drifting with the general list into lower prices, electric light and power stocks in the "Electrical World" average, dropped this week to a low point for the year, 19.6; last week, 20.6. Previous low 18.5 in late June, 1932, remains a record.

recommendations to the members of the industry and to the Administrator with respect to ways and means of securing uniform and accurate accounting and reporting of transactions and results, as to any and all matters relating to or affected by the operation of this code.

(E) No provision of this code shall be so applied as to permit monopolies or monopolistic practices that are contrary to law, or to eliminate, oppress or discriminate against small enterprises.

Article IX—Modification

1. As required by Section 10 (b) of Title I of the act, this code provides that the President may from time to time cancel or modify any order, approval, license, rule or regulation issued under that title.

2. This code, except as to provisions required by the act, may be modified on the basis of experience or change in circumstances, upon application to the Administrator by the Code Authority or upon petition to the Code Authority by members of the industry whose sales of electrical energy during the preceding calendar year have been at least one-half of the total energy sold by all members of the industry during such period. After a hearing held upon such notice as the Administrator shall specify, such a modification shall become effective upon its approval by the Administrator and by the President.

3. By presenting this code and/or in complying therewith, those who have participated therein do not thereby consent to any change therein or to the imposition of further or different requirements, except as each may thereto subsequently agree, and do not waive any rights under the Constitution of the United States or consent to the imposition of any requirements contrary thereto.

Article X—Effective Date and Termination

1. This code shall become effective on the second Monday after its approval by the President.

2. This code and the administrative agencies created hereunder shall terminate on June 16, 1935, or sooner if Title I of the National Industrial Recovery Act shall cease to be in effect.

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Utility Contests Gas Order of California Commission

For the first time in 21 years of operation under regulation Pacific Gas & Electric Company has applied to the federal courts for a temporary restraining order and writ of review from the order of the California Railroad Commission reducing its gas rates by $2,100,000 annually, or to an amount estimated to yield a return of 6.6 per cent on the commission's valuation.

Bitter condemnation of the utility's move has been voiced by President Clyde Seavey of the commission, who states, "I wish to give it as my personal opinion that if exorbitantly paid utility executives and high-priced attorneys can delay so just and reasonable an order as this the only adequate protection the consumers of this state have is public ownership. And the sooner they get it the better."

The company's complaint to the court is based upon asserted violation of the Fourteenth Amendment to the federal Constitution and enumerates these alleged violations: Depriving the plaintiff of its property and the use thereof without due process of law; denying the plaintiff of equal protection of the laws and taking the plaintiff's property and the use thereof for public use without just compensation.

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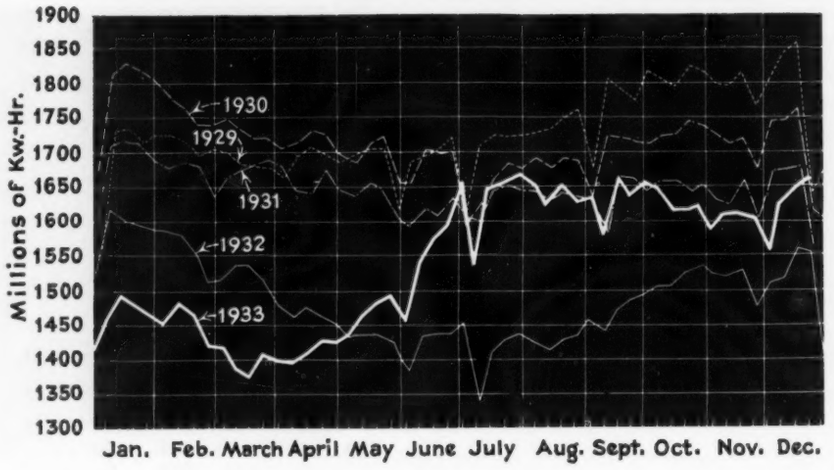
Output Just Misses 1933 Record



Energy production in electric light and power plants rose to 1,656,616,000 kw.-hr. during the week ended December 23, according to the Edison Electric Institute, and so by a narrow margin missed matching the peak for the year, attained in September.

The increase over the preceding week widened the gain over 1932 to 6.6 per cent and cut down the disparity compared with 1931 to 1.1 per cent, if the last full week before the holiday is used, as it should be, in each year.

Every region except New England increased its lead over 1932, the Rocky Mountain region rising to 16 and the Central industrial to nearly 10 per cent over last year.

Weekly Output, Millions of Kw.-Hr.

1933	1932	1931
Dec. 23... 1,657	Dec. 24... 1,554	Dec. 26... 1,565
Dec. 16... 1,644	Dec. 17... 1,563	Dec. 19... 1,676
Dec. 9... 1,619	Dec. 10... 1,519	Dec. 12... 1,672
Dec. 2... 1,554	Dec. 3... 1,510	Dec. 5... 1,671
Nov. 25... 1,608	Nov. 26... 1,475	Nov. 28... 1,600

Per Cent Change from Previous Year

	Week ended		
Region	Dec. 23	Dec. 16	Dec. 9
New England	+ 6.7	+ 7.1	+ 6.4
Middle Atlantic	+ 6.1	+ 4.1	+ 6.2
Central Industrial	+ 9.6	+ 8.2	+ 8.8
West Central	+ 3.1	+ 2.4	+ 0.8
Southern States	+ 1.5	— 0.9	+ 0.5
Rocky Mountain	+16.0	+14.6	+21.0
Pacific Coast	+ 2.7	+ 1.0	+ 3.2
United States	+ 6.6	+ 5.2	+ 6.6

British Output Peaks Last Year by 9.5 per Cent

Further substantial increase in the generation of electricity in the United Kingdom took place in November. Official returns rendered the Electricity Commissioners show 1,420,000,000 kw.-hr. to have been generated by authorized undertakers in the month, compared with the revised figure of 1,230,000,000 kw.-hr. in November, 1932, a 15.4 per cent increase. The number of working days in the month was 26, the same as last year.

In October the increase over the same month last year was 13.2 per cent, and in September the increase was 10.8 per cent. During the first eleven months of 1933 the total amount of electricity generated by authorized undertakers was 12,018,000,000 kw.-hr., compared with the revised figure of 10,972,000,000 kw.-hr. for the corresponding period of 1932, an increase of 9.5 per cent. Should the present rate of expansion be maintained the total for this year would be about 10 per cent above last year.

In 1928 Britain's output of electricity was only 9,073,000,000 kw.-hr., so that there has been an increase of 50 per cent in five years. The greater activity of industry provides the key to the 15.4 per cent increase just disclosed in the November figures.

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$500,000 Conditioning Contract

What is said to be one of the largest air-conditioning contracts to have been consummated has been awarded Frigidaire Corporation by the Pennsylvania Railroad. Rolling stock of various kinds is to be equipped at a cost of $500,000.

New York Metal Prices

	Dec. 19, 1933, Cents per Pound	Dec. 26, 1933 Cents per Pound
Copper, electrolytic	8.25	8.25
Lead, Am. S. & R. price	4.15	4.15
Antimony	7.25	7.12½
Nickel ingot	35.00	35.00
Zinc, spot	4.85	4.80
Tin, Straits	53.30	53.00
Aluminum, 99 per cent.	23.30	23.30

Rotating Machinery Report by Standards Association

The first report of the sectional committee on rotating electrical machinery, organized in 1930 under the auspices of the American Standards Association, has just been published. The report includes standards for direct-current rotating machines; synchronous generators, synchronous motors and synchronous machines in general; synchronous converters; induction motors and induction machines in general, and a.c. and d.c. fractional-horsepower motors. This report is largely based upon the five standards of the American Institute of Electrical Engineers on these same subjects. Since the proposed new standards are in the nature of a revision, they will, when approved, supersede these five standards. The scope of the standards has been broadened, however, to include, in addition to the material covered in the A.I.E.E. standards, a large number of widely used standard rules developed by the National Electrical Manufacturers Association.

Up to the present time these A.I.E.E. and N.E.M.A. standards have served as the principal bases of specifications for electrical machines. It is expected, A.S.A. announces, that the combination of these two important sets of standards in a single publication, to be approved finally by the standards association, will be of maximum usefulness to the buyer, seller and manufacturer of rotating electrical machinery.

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Self-Protecting Transformer Avoids Various Hazards

Immunity to even direct lightning strokes, to short circuits and to damaging overloads while permitting the last bit of capacity to be extracted with perfect safety are the engineers' claims for a new type of self-protecting distribution transformer. Other virtues are lower installed and operating costs than are offered by standard transformers with associated apparatus. Because of the precise thermal protection involved a higher ratio of connected load to transformer capacity is also possible.

Essentially, this Westinghouse design consists of a Deïon-gap-protected transformer whose fused cutouts have been replaced by a small circuit breaker mounted inside the tank and operated by a combination of load current and oil temperature. In addition to the thermal protection characteristics made possible by the circuit breaker, the performance of the Deïon gaps has been so improved that they can discharge the heavy currents of direct strokes and at the same time limit the surge voltage across the transformer insulation to a safe value.

Operating men who have inspected the new transformer express particular interest in the thermal protection. Overloads mean nothing to the transformer, since their duration is automatically valued by the thermostat's response to damaging temperatures of the winding's insulation. Also, the design permits higher loads to be carried with lower ambient temperatures. For currents above 500 per cent load and up to short circuit tripping is much faster than obtained with conventional fuses.

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Britain May Light Main Highways With New Lamps

So successful has the installation of gaseous discharge lamps for highway lighting on Romford Road, Ilford, England, proved to be that active plans for the use of such sources in other metropolitan areas of Britain are under definite consideration. A number of trial installations, notably at Wembley, have preceded the main arterial road lighting work at Ilford.

On the Romford Road section thirteen units have been attached to trolley wire supporting posts at a height of 20 ft. and on alternate sides of the road approximately 120 ft. apart. The maximum foot-candle intensity on the 37-ft. roadway is 2.1; the minimum 0.15. The lamps are of 400-watt rating.

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Electric Cooking in Italy

In a district in Calabria, South Italy, where until a few years ago there was not a single electric household appliance in use, 1,302 out of 27,472 users of electricity are reported to have installed electric cookers. They have been encouraged in this use by a flat-rate tariff, 62 per cent of the consumers being on this basis and 38 per cent on meters. The flat rate in Calabria is based on 0.9 kw.-hr. per person per day, making the rate for a family of four persons 36 lire per month. Merchants and commission agents are paid 8 to 20 per cent commission for sales of electric appliances by the Societa Meridionale di Elettricita of Naples, although they have been less effective in extending usage in small towns than the company employees, which means every one from officials down to workmen.

Major New Construction This Week

Canada Northern Power Company, plans 70-mile transmission line in Cadillac Township to serve Siscoe, Que., and vicinity, also power substations and distribution facilities.

Austin, Tex., plans extensions and improvements in city-owned electric light and power plant, including new 7,500-kw. turbo-generator unit with accessories. Appropriation of $400,000 secured.

Northwest Distilleries Corporation, Seattle, Wash., plans $200,000 expansion.

Delta, Colo., to build city-owned light and power plant at cost of $150,000. Financing being arranged.

Motors, controls, pumps, conveyors, regulators, etc., will be installed in molasses plant of Molaska Products Corporation, at Elizabeth, N. J. Cost $150,000.

Menomonee Falls (Wisc.) Distilling Company, to expand at cost of $185,000.

Iowa City, Iowa, has authorized plans for city-owned electric light and power plant. Cost $800,000. Federal aid to be sought.

Motors, controls, regulators, conveyors, etc., will be installed at Columbia Iron Works, Chattanooga, Tenn. Cost $200,000.

Old South Brewing Company, Winston-Salem, N. C., will build at Statesville, N. C. at cost of $115,000.

Two Rivers, Wisc., has applied for Federal loan of $250,000 for city-owned electric light and power plant.

Norman, Okla. plans city light and power plant. Cost $600,000. Federal aid sought.

Transformers, motors, pumps, conveyors, etc., will be installed in oil refinery at Long Beach, Calif., to be constructed by E. Donald Marr, and associates. Cost $200,000.

Oklahoma Project Protested

On the grounds that the proposed $4,000,000 hydro-electric project on the Arkansas River near Kaw City and Fairfax in Osage County would require a large expenditure for water storage areas and incidental generating facilities, Oklahoma Gas & Electric Company and Public Service Company of Oklahoma have filed protests and briefs with the state Department of Waterways, Power and Flood Control opposing the undertaking.

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First Rotary Serves 31 Years

More than 31 years ago, announces the General Electric Company, the first of a number of rotary converters went into operation on the government tramway electrification in New South Wales, Australia. Recent reports show the converter to have completed 122,664 hours of service and to be in regular service now. The only repairs made on the machines were made in 1930, when two slip-rings were replaced.

As to Rates——

• Consolidated Gas Company's and subsidiaries' electric and gas rate case order has been extended until January 5, the Public Service Commission notified Justice Gilbert C. Schenck of the Supreme Court last week. Justice Schenck had asked for a delay pending his decision on an application by the five interested utility companies for an injunction against the commission. The reduction was to have become effective December 20, but postponements were had.

• Queens Borough Gas & Electric Company was ordered last week to reduce its rates $360,000 a year, or 15 per cent. These new temporary emergency rates, to become effective as of September 15, 1933, will mean a reduction on all bills for electric-metered service to general consumers, according to the commission. The new rates were fixed by a majority vote of the commission. They are the result of a rehearing of the commission's order of last August which cut rates 18 per cent, with an annual saving of approximately $445,000. The new rates purport to make allowance for the added burdens imposed upon the company by city taxes and the requirements of the NRA. It is expected that the company will resort to the courts for a stay of the order, pending final adjudication of its validity. Commission Chairman Maltbie's opinion, upholding the order, set forth the same reasoning which marked his recent opinion backing an order for a 6 per cent cut in rates of electric subsidiaries of the Consolidated Gas Company serving New York City.

• Niagara Hudson Power Corporation system's new rate schedule, which will mean a saving of $800,000 for customers of eight of the system's companies, has been accepted by the New York Public Service Commission. The commission voted to discontinue pending actions against the eight companies. The companies affected by the new schedule cover a wide area in the state, including such communities as Buffalo, Tonawanda, Niagara Falls, Syracuse, Fulton, Oswego, Albany, Troy, Watervliet, Rensselaer, Schenectady, Amsterdam, Glens Falls and numerous other cities and towns. Of the $800,000 reduction all but $100,000 is applicable to residential service.

• Potomac Electric Power Company rate hearing has been set by the Public Utilities Commission to begin January 20. Study of the records of the company's business as filed with the commission indicates rates may be reduced to an extent effecting a saving of a half million dollars, approximately the same as was the case a year ago. There was no statement from the commission, however, on the expected change in rates prior to assembling of data at the hearing. The rates are reviewed each year under the sliding scale plan adopted by the commission, under which excess profits of the company are divided between the company and the public. Expenses of the company are somewhat higher this year than last as a result of the new tax on capital stock and the transferring of the current sales tax to the company from the consumer. The merger of the street railway lines, which separated the Washington Railway & Electric Company from the Potomac Electric Power Company, effective December 1, also may have an effect on profits and expenses, it was stated. Another matter to be considered at the hearing is an increase in the valuation of the power company property resulting from the new power plant at Buzzard Point and the new transmission line to the Safe Harbor hydro-electric plant of the Consolidated Gas, Electric Light & Power Company of Baltimore.

• Duke Power Company and its subsidiary, the Southern Public Utilities Company, have been granted an extension from December 24 to January 4 for reply affidavits to documents of the South Carolina Railroad Commission, electrical utilities division, suggesting that the affiliated companies slash their rates in South Carolina approximately $1,000,000 a year (ELECTRICAL WORLD, December 23, page 810).

• Central Illinois Public Service Company's rate structure is under investigation at the present time by the Illinois Commerce Commission. Upon complaint of some of the towns served, the commission recently requested a display of rate-fixing facts from the company, which the commission found to justify the rates now in effect. The towns, however, pushed their request further, with the result that the commission has undertaken an investigation on its own part. To avoid the usual prolongation of such investigations, the commission has selected 30 communities in which the investigation will be pushed. It is expected that the investigation will be completed in from four to six months, whereas if all the 467 towns were to be investigated the time would be prolonged to two years or more.

"In making these selections," J. H. Matthews, chief engineer for the commission, said in a public statement, "consideration was given to all factors which might contribute toward making them representative of the entire system, among these factors being size, density of population, geographic location, character of community with reference to manufacturing, mining and agricultural development, electrical saturation, and standards of construction.

"It is not the purpose, in making these selections, to establish rates especially for these individual communities, but rather to obtain a representative picture of the entire system for the purpose of establishing rates for the system as a whole. No effort will be made in this particular program to allocate to these specifically selected communities their pro rata share of the general property, such as power plants and transmission lines, nor to apportion expenses to them in such manner as would be necessary if an effort were being made to determine the rates in each local community."

• Savannah Electric & Power Company will probably be forced to abandon the service charge of $1 now collected when a hearing comes before the Georgia Public Service Commission the first of the year. The commission is strongly opposed to such a charge and is determined that there shall be none such in the state. Preliminary meetings between officials of the company, which is a Stone & Webster operation, and the commission indicate an amicable readjustment of rates downward of about 31 per cent. Heretofore readjustments that have been made benefited mostly the large industrial consumer, while the present schedule set up by the commission is especially directed toward the relief of the smaller consumer. Approximately 46 per cent of the entire number of customers will reap the benefit of the greater reduction, it is understood.

• Central Power & Light Company's charges for electric light and power have been questioned by the South Texas Municipalities League, which is raising a fund with which to conduct a complete engineering survey of the properties of the company with the purpose of effecting rate reductions in about 80 cities and towns served. It is proposed that a 20 per cent reduction be sought.

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Sierras Sale Approved

Sale of properties of the Southern Sierras Power Company in Inyo and Mono Counties, California, to the city of Los Angeles and the Department of Water and Power of that municipality has been approved by the state Railroad Commission. (ELECTRICAL WORLD, December 9, page 744).

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Automobile Elevator for Ship

A special automobile elevator, said to be the largest and most unusual ever projected for ship use, is being built by Otis-Pifre in Paris for the new French liner *Normandie,* the 72,000-ton ship that will go into service in 1935. With a lifting capacity of 11,000 lb., this will be the heaviest duty elevator ever to be installed in a commercial ship. It will have a speed of 100 ft. a minute, with micro-self-leveling and automatic push-button control.

Municipal Items

WEST FRANKFORT, ILL.—Petitions are being circulated urging the City Council to abandon plans for the construction of a municipal power plant. The city recently applied to the federal government for a loan of $670,000 to construct the plant.

PARIS, KY.—This city must offer its electric franchise for sale, according to the ruling of the Court of Appeals in deciding a three-year-old case brought by Kentucky Utilities Company against the Board of Commissioners. The constitutionality of act of 1926 Legislature which requires cities, except a city of first class, to offer a similar franchise for sale eighteen months before expiration of a franchise was upheld. Litigation began in 1930 when the utility company sought to force the city to offer its franchise for sale. Meanwhile, litigation was carried on through the Court of Appeals upon the right of the city to issue bonds for the construction of a municipal light plant. This action the city won, floated a $150,000 loan and now has its plant operating.

CAMDEN, N. J.—Hearing in the suit brought by the Public Service Electric & Gas Company to block construction of a municipal light and power plant began last week. William MacDonald, special examiner for the New Jersey Supreme Court, took testimony and will present to the court the entire testimony, which it is expected will require several weeks. The case is to test the legality of the November 7 election, at which the plan for a municipal plant was approved by a majority of voters, on the grounds that the petitions calling for the referendum were improper. The first witness called testified that the name on the petition is not his signature. Other witnesses will be called.

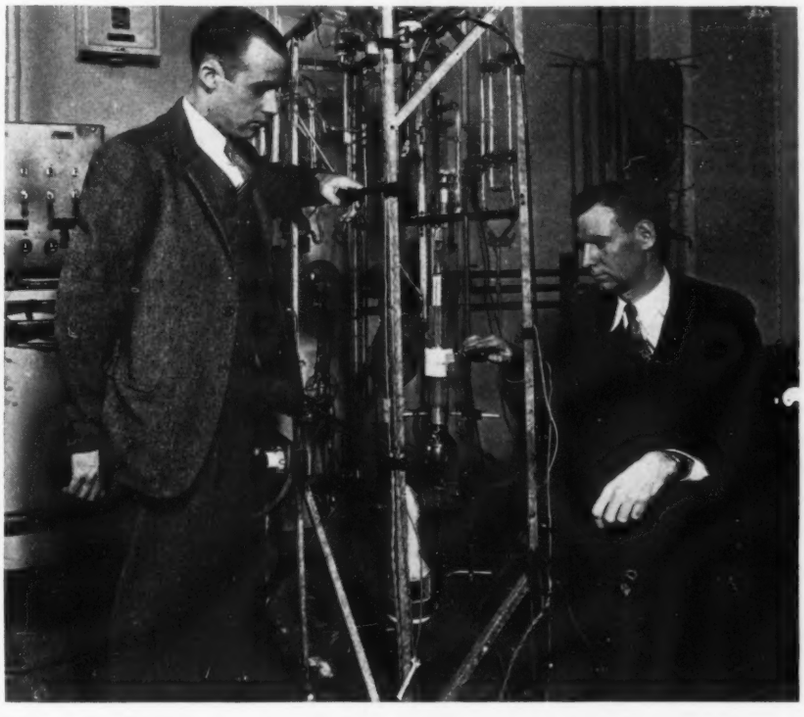
ST. PAUL, MINN.—Franchise discussions between the Northern States Power Company and city officials, which have been discontinued (ELECTRICAL WORLD, December 23, page 811), are expected to lead to a vote by citizens on the proposition to establish a municipal electric power and gas plant. It is proposed to issue $28,000,000 of bonds for the purpose. The proposal to construct a plant sufficiently large to supply the entire needs of the city is being sponsored by Mayor Mahoney. It is alleged that such a plant would result in a 30 per cent reduction in electric and a 60 per cent reduction in gas rates as compared with the rates now paid. Commissioner May, however, would enter the field on a more limited scale. He proposed construction only of a plant to supply electricity, gas and steam heat to city and county buildings. This, he said, would involve expenditure of approximately $300,000 and would demonstrate the economies possible under municipal management.

SAN ANGELO, TEX.—R. H. McDonnell, engineer employed to make a survey and estimates on the cost of constructing an electric light and power plant here, has reported to the city commission that the cost of the proposed plant and distributing system will be approximately $879,450. He said that the plant should enable the lowering of the commercial rates 25 per cent as compared with the existing rates for this service.

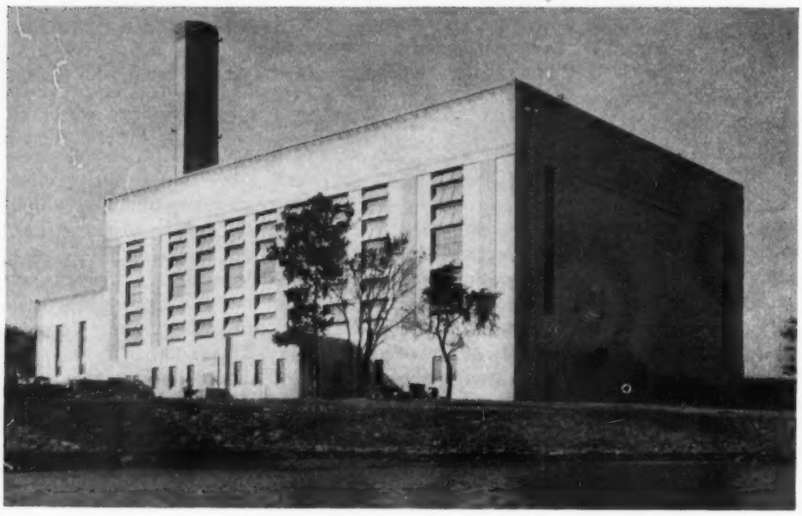
FORT WORTH, TEX.—Notwithstanding the recent action of the City Council in agreeing not to consider further the matter of constructing a municipal electric light and power plant in accordance with the agreement with the Texas Electric Service Company to reduce its commercial rate, the Municipal Ownership League is circulating a petition asking that an election be called to vote on the construction of the proposed plant.

CULPEPER, VA.—Virginia Public Service Company has attempted to halt the progress of the town toward the erection of its municipal power and light plant. The attempt came in the form of an application to the Circuit Court for an injunction to restrain the town from issuing the general obligation bonds to the sum of $120,000 on the grounds that the recent state legislative act empowering municipalities to create such indebtedness without the vote of the people is unconstitutional. In addition to the utility's application, some fifteen or twenty local taxpayers also petitioned the court for such an injunction.

New Vacuum Tube for Atomic Research



Notable advance in the technique of atomic research is said to have been achieved by Drs. Edward S. Lamar and Overton Luhr of the physics department of the Massachusetts Institute of Technology through development of a new vacuum tube for the production of positively charged hydrogen atoms for high-voltage bombardment. The yield of these atoms, or protons, is increased at least ninefold by an electric arc operating in hydrogen at low pressure in the enlarged section at the bottom of the tube between an incandescent filament and a neighboring electrode. Ordinarily such an arc would produce 10 per cent protons and 90 per cent molecular ions, but by surrounding the arc with a third electrode maintained at a negative potential of a few hundred volts the proportion of protons is increased to about 90 per cent. President Karl T. Compton of the institute states that a 1,000,000-volt bombardment with a proton source will give the same results in attacking atomic nuclei as 2,000,000 volts with an ordinary molecular ion source. This method is expected greatly to advance investigations of chemical elements, transmutation and the energy locked in atoms, in connection with the 10,000,000-volt direct-current generator designed by Dr. R. J. Van de Graaf which recently was tested to 7,000,000 volts at Round Hill, Mass. (ELECTRICAL WORLD, December 2, page 709).



Buzzard Point Station

By W. J. LANK
Potomac Electric Power Company.

FOR a number of years the city of Washington, D. C., and metropolitan area served by the Potomac Electric Power company has relied on a single power generating source, the Benning station, located on the Anacostia River to the east of the city proper. In 1931 a 30,000-kw. unit addition completed the economical development of this site with an installed capacity of 208,000 kw. In March of this year a 230,000-volt transmission line connecting with Safe Harbor and other hydro and steam stations of the Consolidated Gas & Electric system of Baltimore was put into operation. This line terminates in the Takoma Park step-down station located at the north of the city proper. On November 16, 1933, the new Buzzard Point steam station was added to the Washington system, supplementing the Benning and Takoma Park power supply. This station is located to the south of the city proper on the west side of Anacostia River near its junction with the Potomac River.

Selection of New Site—When the decision had been made to establish a new steam generating station a number of locations were studied. All of the sites considered suitable for power station purposes, with the exception of the Buzzard Point site, are located so as to require crossing the Anacostia or Potomac rivers with cables to reach the city. The Buzzard Point site was selected because of its many advantages, among which are the following:

(a) Its location on the city side of the river permits of cable connections to load centers without river crossings.

(b) Ample supply of condensing water is available.

(c) The area is zoned for industrial purposes.

(d) Coal or fuel oil may be delivered by rail or water.

(e) The site in nearer the principal load centers than any other available site.

Congressional authority was necessary for extension of the railroad from the Navy Yard to the site as well as for closing certain streets and for other important purposes.

Features incorporated in new station

The station is designed for ultimate development to six generating units, possibly two 35,000-kw. and four 50,000-kw. or a total capacity of 270,000 kw. The initial development includes building space for two complete generating and boiler units. Two boiler units and only one turbo-generator will comprise the initial installation. It is planned that ultimately one boiler unit will supply one generating unit.

The boiler operating floor is at the same level as the turbine floor. There is no curtain wall separating the boiler room from the turbine room. The boiler operating aisle is on the side toward the turbine room so that the operators of these respective equipments may be easily accessible to each other.

A steam pressure of 650 lb. and a total temperature of 835 deg. at the turbine throttle was selected—values at which the present commercially available metals permit reliable performance and which avoid the use of a more complicated reheating cycle to insure satisfactory conditions within the turbine. As was found in the case of the three 30,000 kw. additions at the Benning station, economical balance dictated that the simple regenerative cycle with three-stage bleeding points for feedwater heating was desirable for this station. A station heat rate of about 12,200 B.t.u. per net kilowatt-hour output is expected at full load. The heat rate of this station with respect to the Benning station is such that it is desirable for base-load operation.

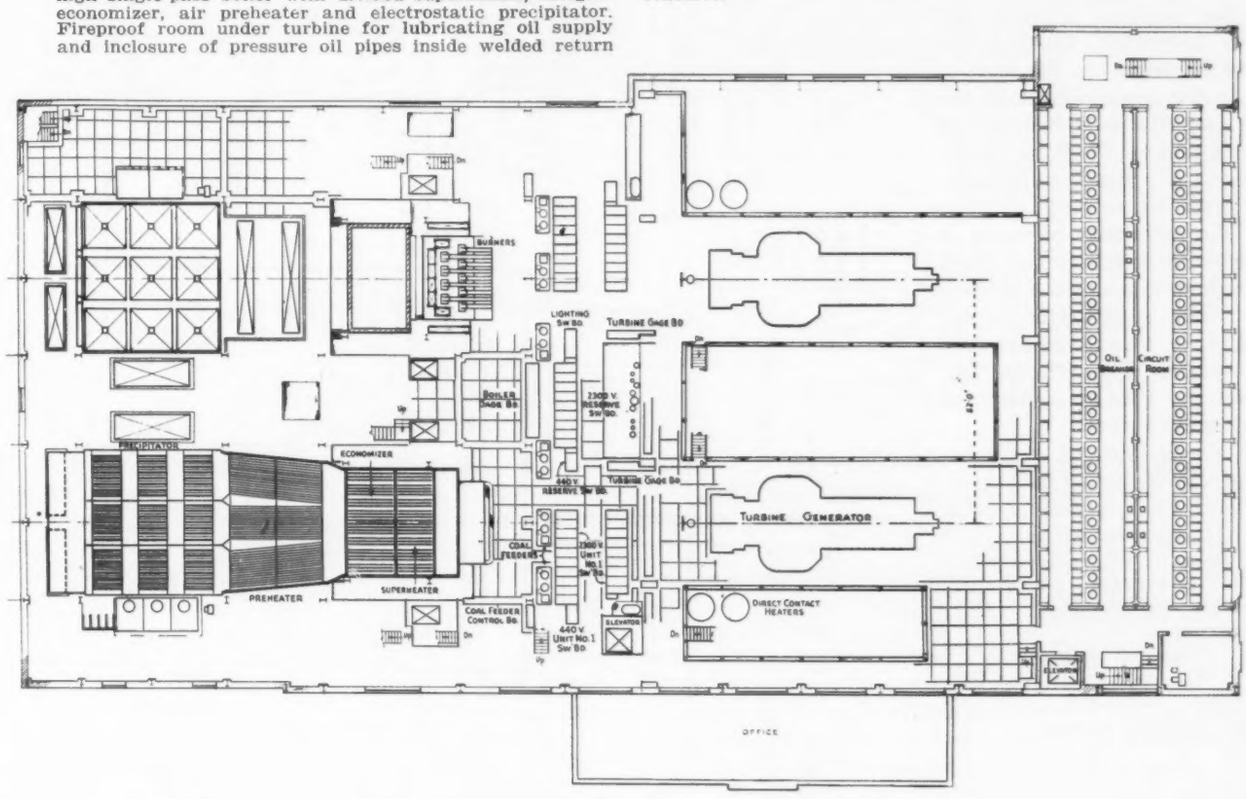
Of greater importance, however, than good economy is the ability of the plant to meet operating conditions. In operating steam stations in parallel with hydro stations, particularly during periods of high river flow, it is of utmost importance to respond to rapid fluctuations of load over a wide range and provide quick "pick-up" ability from minimum load point. Features incorporated in this plant by the designers to meet this condition are large drum volume with efficient moisture eliminators, a few rows of very active boiler surface set to insure rapid and reliable circulation, a complete water-cooled furnace proportioned to absorb maximum heat and also to maintain proper ignition conditions, centralized control with complete automatic combustion control and pulverized fuel equipment of large capacity. The unit-mill pulverizer system was selected as being most suitable for operating conditions and to permit adherence to the unit-layout principle, compactness and low building height required by zoning regulations. The boilers are designed to burn a variety of coals, fuel oil or natural gas. West Virginia coal is used initially and probably will continue to be used in the future.

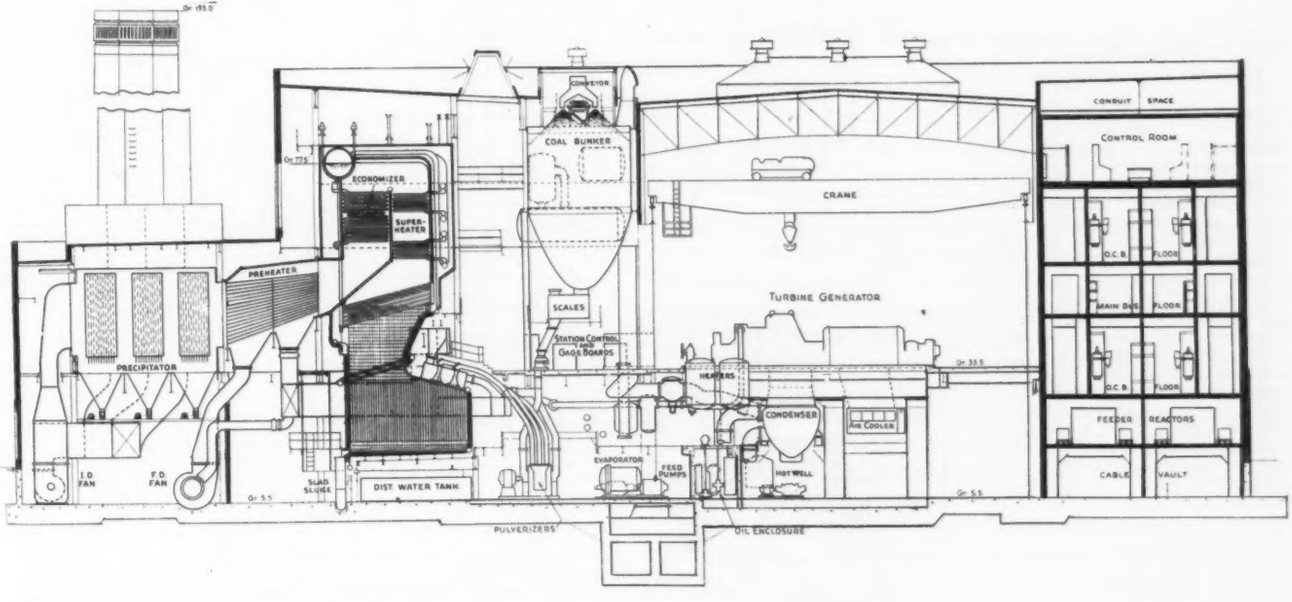
Because of the extreme importance in Washington of avoiding smoke emission, or the discharge of cinder and fly ash from the stack, there has been provided, in addition to complete automatic combustion control, Cottrell electrostatic precipitator equipment in larger proportions than usual.

Arrangement of Mechanical Equipment—The arrangement of equipment is shown by Figs. 1 and 2. The boilers are Babcock & Wilcox single-pass, long cross-drum 72-in. x 33-ft. 6-in. type with vertical pulverized coal firing and slag bottoms. Both superheater and economizer are located directly above the boiler bank, separated from each other by water-cooled baffle. After leaving the economizer the gases are directed by a sloping baffle so as to have even distribution into and through the air preheater to the electrostatic precipitator arranged three sections deep. Throughout the design has been made with particular effort to provide a smooth flow of gas with elimination of cinder and soot pockets.

Figs. 1 and 2—Plan and cross-section of new station

Absence of wall between boiler and turbine rooms makes operators readily accessible to each other. Note use of high single-pass boiler with divided superheater, integral economizer, air preheater and electrostatic precipitator. Fireproof room under turbine for lubricating oil supply and inclosure of pressure oil pipes inside welded return drain lines avoid fire hazard. Unit-type pulverizers, vertical firing and slag-tap furnaces constitute other features.





Each boiler unit is provided initially with two Riley mills and six burners; provisions are made for adding another mill and three burners in the future. Although the boiler evaporating surface contains only 5,488 sq.ft. the present capacity is 375,000 lb. per hour of steam (approximately 12,000 boiler horsepower). Furnaces are completely water-cooled and have a slag screen composed of staggered refractory-covered tubes across the throat of the furnace just above the level of the burners. These are fired downward so that the flame impinges on the slag at the bottom, causing the larger slag particles to be thrown off at this point. The slag screen tubes are spaced sufficiently far apart to prevent bridging and the refractory covering is designed to keep the slag fluid enough to run down and drip off. The superheater is arranged in two sections with an external desuperheater between the two to control the final temperature.

A single-cylinder, eighteen-stage, 35,000-kw., 1,800-r.p.m. General Electric turbine with eight admission valves is set crosswise of the turbine room over a 30,000-sq.ft. single-pass, two-compartment Ingersoll-Rand condenser. Foster Wheeler direct-contact type of heaters are used for three-stage bleeding points.

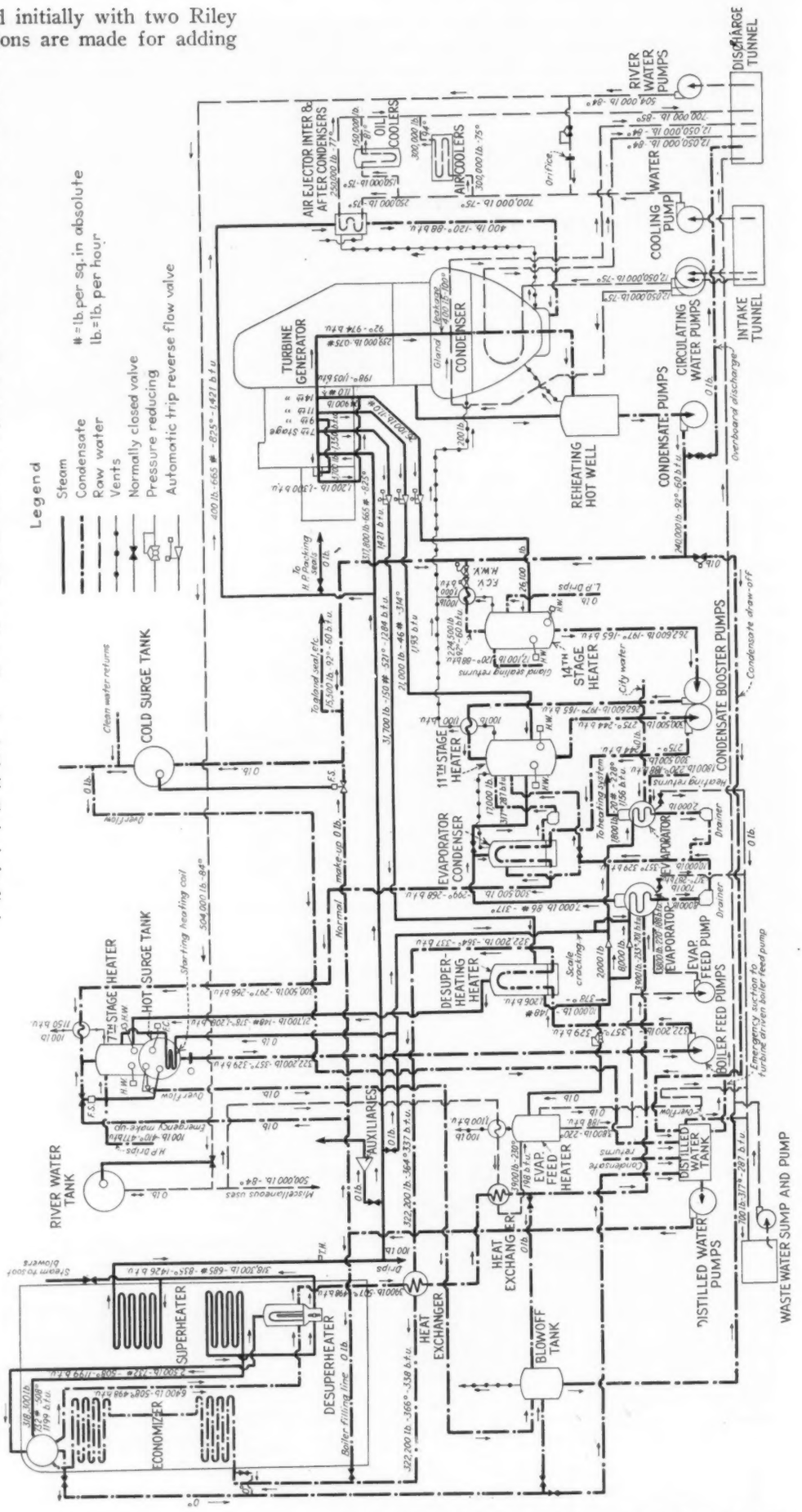


Fig. 3—Heat balance and general flow diagram

Figures show average flows, pressures, temperatures and heat contents for gross generator output of 35,000 kw. with circulating water at 75 deg. F. H.W.—safety device closing reverse flow valves in bled steam line and water admission valve (H.W.V.) in event of high water in open heaters. H.W.V.—high water condensate shut-off valve operated by safety device H.W. F.S.—float switch for starting and stopping distilled water pumps for delivery of make-up through float-controlled valves. F.C.—remote-float control for valve F.C.V. F.C.V.—float control valve operated by F.C. T.H.—thermostat for control of desuperheater.

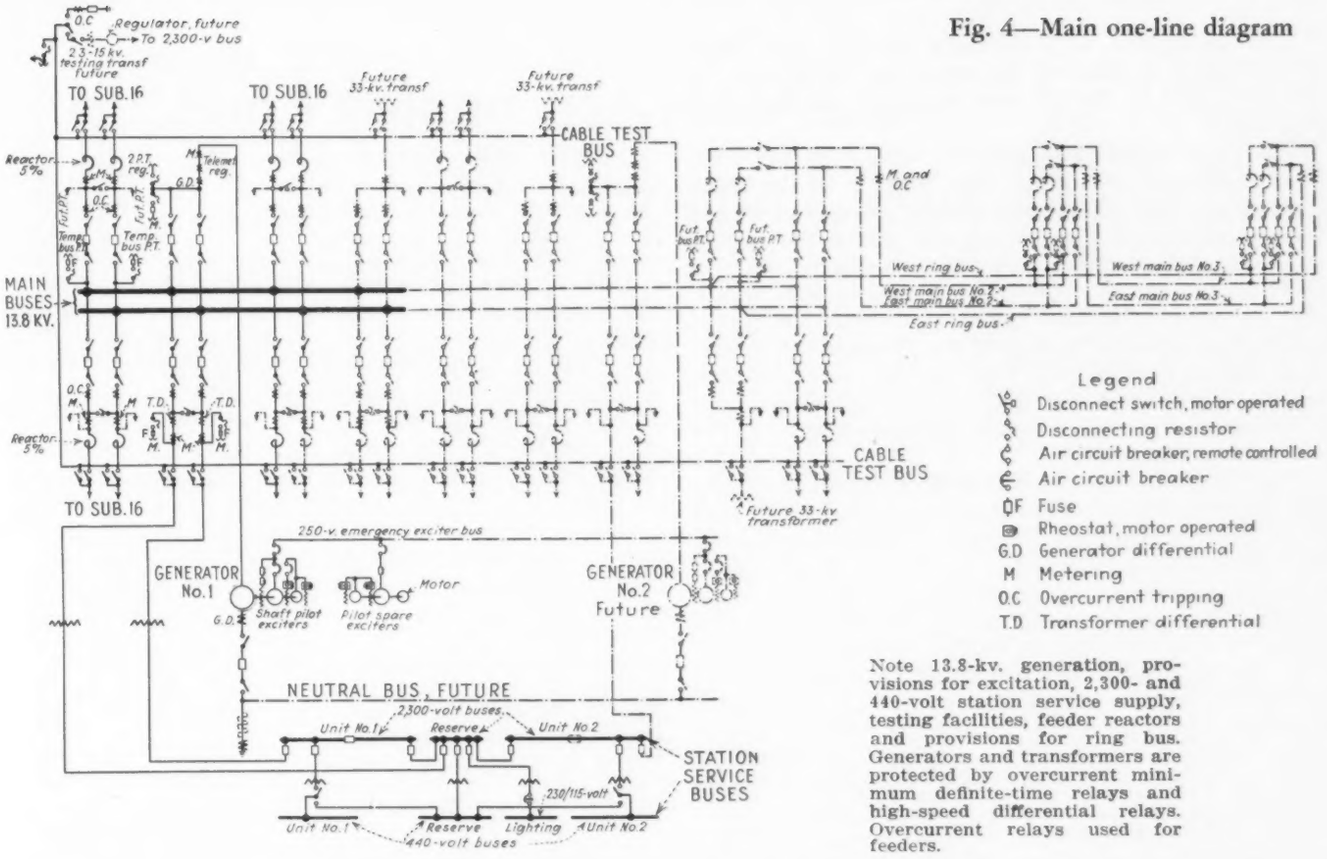


Fig. 4—Main one-line diagram

Note 13.8-kv. generation, provisions for excitation, 2,300- and 440-volt station service supply, testing facilities, feeder reactors and provisions for ring bus. Generators and transformers are protected by overcurrent minimum definite-time relays and high-speed differential relays. Overcurrent relays used for feeders.

Because there have been several disastrous fires in the past few years as a result of lubricating oil leaking on high-temperature steam lines, the oil reservoir pumps, purifiers, strainers and coolers in this station are isolated in a fireproof room located under the turbine. All pressure oil piping to the governor, bearings and extraction line valves is run inside of and spot welded to the top of the welded oil drain lines returning to the reservoir. This room, as well as the main generator, is protected with a separate Lux CO_2 fire-extinguishing system. A separate fireproof room for oil storage, filtering and conditioning is protected with steam-smothering nozzles. The high-temperature steam-line flanges are protected by special covering of high-temperature insulation, asbestos and aluminum foil designed for ready removal.

Heat Balance—The station flow diagram is shown in Fig. 3. Quantities are for a heat balance at 35,000 kw. and 1½-in. back pressure. The condenser is equipped with a reheating hotwell separate from the main condenser. From the hotwell the flow of the condensate can easily be traced through the heaters to the economizer. The seventh, eleventh and fourteenth stage heaters are of the direct-contact type and therefore a pump is required between each heater. A desuperheating heater increases the extraction at the seventh stage and heats the condensate about seven degrees above saturation temperature. Make-up is furnished by the evaporator, which uses steam from the desuperheating heater to evaporate the make-up. The evaporator condenser is between the seventh and eleventh stage heaters. With continuous blow-down in use, the heat is recovered by heat exchangers.

Electrical Equipment—The generator unit is rated 38,888 kva., 90 per cent power factor, 60 cycles, 13,800 volts and equipped with direct-connected main and pilot exciters. A spare 200-kw. motor-driven exciter is installed. The generator air cooler uses river water as a cooling medium.

With the exception of one boiler feed pump, all station auxiliaries are motor-driven. There are three seven-stage feed pumps rated 800 g.p.m., each handling hot water at 357 deg. F. One of these pumps is normally sufficient to supply all the requirements of one boiler, but on account of the extreme importance of this service a spare unit was provided driven by a 700-hp. single-stage, non-condensing turbine capable of automatically attaining full speed from cold start in 30 seconds. The other two pumps are driven by a 700-hp. slip-ring, variable-speed, 40-deg. motor.

Inasmuch as the ultimate arrangement contemplates a boiler and turbine operating together as a unit, the auxiliaries for each main unit are grouped separately. Two 4,000-kva., 13,800/2,300-volt, three-phase transformers are provided, one for supplying the auxiliary motors for each main unit. Ultimately there will be a spare 6,000-kva. transformer, to which the auxiliaries of any unit may be automatically transferred in case of trouble with the normal supply. However, as one of the boiler units will be spare until a second turbo-generator is installed, only the two transformer banks are regarded as necessary at this time.

Most of the auxiliary equipment is driven by 2,300-volt motors, but the smaller motors and coal-handling equipment motors are 440 volt. The 440-volt equipment for the first two main units is supplied from two banks of 400 kva. each and one 600-kva. bank, all 2,300/440-volt, three-phase transformers.

Speed control of the forced and induced draft fans is of interest. These fans are driven by constant-speed, squirrel-cage motors through hydraulic couplings. Con-

trol of speed with high efficiency through wide range of operation is obtained by automatic adjustment of the weir level in the oil tank supplying the hydraulic coupling.

The main switchboard room is located on the sixth floor of the electrical bay. This board is of the bench type, containing control switches and mimic bus with a vertical panel section on which are located the various indicating instruments. Mounted on a separate vertical panel section are the relays and recording instruments. The Leeds & Northrup thermal converter system of metering is used for totalizing the Buzzard Point load with that of Benning and Takoma Park. Located in a separate room from the control room proper are type FA-4 automatic voltage regulating equipment and control battery charging sets.

The main one-line-wiring diagram (Fig. 4) illustrates the switching layout. There are two main 13,800-volt buses built in reinforced concrete structures occupying the fourth floor of the electrical bay. The oil circuit breakers and associated disconnecting switches located in reinforced concrete cells occupy the third and fifth floors. Feeder reactors are located on the second floor. The test bus, feeder line disconnects and potheads are on the first floor. All disconnects are of the remote, manual gang-operated type except the "H" tie disconnects, which are motor gang-operated and controlled from the main switchboard. The 13,800-volt oil circuit breakers are General Electric type, FHK-339 oil-blast units rated at 1,500,000 kva. rupturing capacity. These breakers have a rated arc-rupturing time of 8 cycles referred to a 60-cycle timing wave.

Each outgoing feeder will comprise two three-conductor 350,000-circ.mil type "H" cables rated 6,000 kva. each and is equipped with two oil breakers to permit the circuit being operated from either of the two buses, or to allow the two cables to be operated separately if necessary.

The switchboard for control of 2,300- and 440-volt service is of the metal-clad type and is situated on the turbine floor level between the boiler operating aisle and the turbine room.

Generator and transformer circuits are protected by overcurrent minimum definite-time relays and type RDD high-speed current differential relays. Overcurrent relays are employed to protect feeder cables.

Cable Connections—The scheme adopted for tying in the Buzzard Point station with the distribution system was low in cost and will be satisfactory only so long as the capacity of the station is limited to one generator. In this scheme (Fig. 5) six cables of sufficient capacity to deliver rated output of the generator were run to substation No. 16, located in the downtown load center. Benning station is connected to this substation by existing cables of approximately the same capacity. Under this arrangement the local load may be supplied by either Benning or Buzzard. In addition Buzzard Point can feed power in excess of that required by the local system back to Benning. Buzzard may thus be operated as a base-load station to secure maximum efficiency.

If all cables had been run to one bus at substation No. 16 a three-phase fault on or near this bus would have made it impossible to interchange synchronizing power between the Buzzard Point and Benning stations. These stations would speed up or slow down with respect to each other, depending on load conditions, and if the fault was not cleared quickly, out-of-step conditions would result.

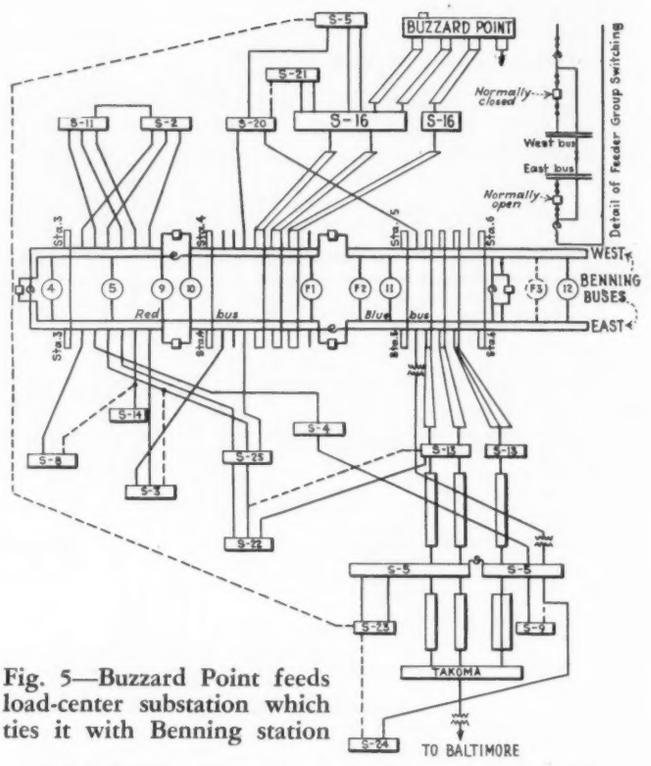


Fig. 5—Buzzard Point feeds load-center substation which ties it with Benning station

Substation No. 16 is located in the downtown load center and its split bus fed by both Buzzard Point and Benning. A clear tie is established between the two generating stations, over which synchronizing power can be exchanged even though a three-phase short-circuit should be established on other path.

By splitting the buses into two sections at substation No. 16 a clear tie is established between the two generating stations over which synchronizing power can be exchanged, even though a three-phase short circuit should occur on the other path. This plan has the additional advantage of reducing the short-circuit currents at these stations and reducing the amount of load dropped in case of a bus fault. The same reasoning led to the splitting of the buses at substations Nos. 13 and 5, which form the tie stations between the Washington system and the Baltimore system.

In the future when the local load in substation No. 16 increases or new units are added at Buzzard it is planned that direct ties between Benning and Buzzard Point of 33 or 66 kv. will be necessary to supplement the existing lower voltage arrangement.

Architecturally, the attractiveness of the new structure has been attained by simple lines and balanced proportions rather than through elaborate embellishments. The structure consists of steel, brick and concrete block. The 90-ft.-high building and 180-ft. brick stack are limited in height by zoning regulations and proximity to the Anacostia Naval Air Field. The arrangement of equipment within the building is pleasing in appearance and reflects careful design. The Stone & Webster Engineering Corporation, in co-operation with company officials and engineers, designed and built the plant.

It is believed that the Buzzard Point power plant, together with the Benning station and 230,000-volt transmission line, will provide assurance to the people of Washington of reliable and economical power supply.

Steam Heating Service Aids Boston Edison Power Sales

THE development of steam heating service by the Boston Edison Company as an aid to obtaining electrical energy customers was emphasized at a recent hearing in the pending rate case before the Massachusetts commission. In reply to a query as to how the company arrives at its steam rates, a brief outline of its experience in the heating field was presented by F. Manley Ives. The company admitted that since the change to central-station steam operation in downtown Boston a few years ago it has not collected all its costs of steam service, because the depression, beginning coincidentally with the change, has seriously retarded the development of this business. However, the business has grown substantially, it has improved atmospheric conditions in the congested area, pipe lines have been extended far into the Back Bay, many new customers have been acquired and the facilities available permit considerable expansion of patronage besides helping the company procure and retain much important power business.

The company first entered into this business about 1895, when it was operating a steam-generating plant at Head Place, Boston, and the exhaust steam was sold in the immediate vicinity of the plant at flat rates. Steam sales in this locality were abandoned about 1900, when the company installed condensing units in its Atlantic Avenue station, Head Place becoming a motor-generator substation. About 1905 there were a large number of combination electric and heating plants in operation in Boston and new plants of this character were being installed in all the large buildings being erected, in the belief that the combined production of steam and electricity offered the cheapest method of securing both services. The company was finding it quite difficult to meet this competition. To obtain the electric business of such concerns, where it could not be secured in any other way, the company inaugurated the practice of taking a lease of the consumer's boiler plant, supplying him with electricity from the Edison system and operating his boiler plant for the supply of his steam requirements.

When the World War began the company had a considerable number of such leases, most of which were for a long term of years and contained no provision for an increase in the rates for steam. During the war and afterward the costs of coal, supplies and labor materially increased, making these contracts, where the rates could not be changed, unprofitable.

Pre-war contracts held back profits

A majority of the leases were in buildings located relatively close together in a small area of the downtown district. Each individual plant had boiler capacity over and above that required for the customer's use. In an effort to cut costs by avoiding the necessity for operating each plant every year, the company decided about 1922 to interconnect these heating plants, thus pooling the capacity of the individual boiler installations. This enabled the company to sell excess steam to prospective customers located on the interconnecting mains.

After some years of experience under this system the results of the steam business showed such a decided improvement that the sales would have been most satisfactory if the company had not been prevented by its pre-war contracts from charging the regular rates then in effect. During the war and post-war periods the isolated plants, because of their high construction costs, were not a serious problem, but with the return to more normal conditions the owners of new buildings began again to consider the installation of isolated plants which would supply the buildings with both steam and electricity. The effort to obtain the electrical business of such buildings, without a steam service to offer, was becoming more difficult. These new buildings were not always contiguous to the existing interconnected steam system. Experience in other cities showed that there was a profit in the central-station steam business, and the Edison company's studies indicated that it could be successfully operated in Boston. The public advantage in the elimination of the smoke nuisance from a number of isolated stacks was also recognized.

The company has a charter right to supply steam, but before entering the business in a large way it had to obtain permission to issue stock for steam plant, and this was sought in 1929 and obtained from the Department of Public Utilities.

Development of prices

Prices for steam must be competitive with the customer's own steam-making costs, taking into account the value of the space occupied by his steam plant and the relief from responsibility. In the beginning the company's investment was relatively small. At that time it was seeking not so much to make a profit out of the steam business as to obtain electric business and discourage the installation of isolated plants in the heart of its territory. At that time little or nothing had been done to improve heating systems, and as there were no reliable steam meters it was necessary to establish flat-rate charges.

The earliest form of steam rates for space heating were based on the radiation installed or the cubic contents of the premises, and rates for other uses were based on the estimated consumption. This kind of rate, even for heating purposes, was not satisfactory because there was no inducement for the customer to economize in the use of steam. The rates, however, were expected to yield the company's out-of-pocket expenses, including interest on such investment as was necessary. The interference of the war with these plans has been noted.

Subsequently, reliable steam meters were developed which permitted the company to change to a quantity form of rate and this was adopted before 1920. When the

isolated plants were interconnected in 1923 the company was able to charge on the basis of the quantity of steam consumed. This form of rate, still used by the company, and in most common application by district heating companies in other cities, is a block form so designed that the average price per thousand pounds decreases as the quantity used increases, yielding larger users lower prices than smaller users. A modification of the block form of rate was later adopted to obtain the business of customers with good load factors, such as hotels and hospitals. This form of rate permits all large customers whose load factors exceed 20 per cent to obtain lower prices than would apply under the straight quantity rate.

The balance computed in the form of net total losses from the operations of the steam-heating department from 1912 to the beginning of 1932 was $358,952, but the electric revenue (in part estimated) during the same period received from customers whose electric service depended upon the supply of steam service was $5,910,000. In 1931 the company sold 545,430,482 lb. of steam. This service is available to any customer desiring to purchase it provided he is located on or adjacent to the steam lines and that the probable income is sufficient to justify the investment required to serve the premises. The company contends that the sale of steam, while not profitable in itself in the initial stages of development, will be profitable, *per se,* when more fully developed. The total steam-heating property considered necessary to the development of the electrical business, including unfinished construction, is valued at $5,373,810. Total steam sales revenue for 1932 was $687,409 and the net revenue excluding fixed charges was $231,440.

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Electrical Maintenance at Rumford Press

By FRANCIS A. WESTBROOK

Center Conway, N. H.

The Rumford Press, Concord, N. H., is a very modern printing establishment completely equipped for individual drive involving some 200 motors. Eighty-five per cent of its business consists of printing some sixty magazines which must be turned out on a rigid schedule, so that it is particularly necessary that the whole plant function without interruption. To this end very careful attention has been given to the maintenance of all the equipment, including all parts of the electrical installation. The procedure followed has been so effective during the last sixteen years, the master mechanic reports, that there has not been a single interruption of service due to the failure of a motor, control apparatus or wiring around the presses.

Once a year the covers are taken off all wiring junction boxes around the presses to inspect for the presence of oil and the condition of the splices. If oil is present it is cleaned out, and if necessary the joints in the wires are retaped and shellacked. This is particularly desirable with the push-button remote-control wiring as it consists of No. 18 A.W.G. flexible fixture wire. This has thin insulation which deteriorates comparatively easily in the presence of oil, which is so likely to gain entrance into the junction boxes. If conditions call for it the whole conduit may be cleaned and new wire installed. As the number of control circuits varies between seven and twelve per press the chance of trouble is considerably multiplied, so that this feature of maintenance is important and obviates much possible trouble. The motor leads and brush wires are looked after in much the same way.

In addition the control panels are gone over once a month, to see that all contacts are clean, and if not to put them in first-class condition. The joints in the wiring at these points are also inspected and repaired when necessary. This work is done during the slack period which occurs each month, when there will be no interference with production. Thus when the rush period comes on there is every reason to expect that there will be no trouble with the operation of the presses. At least every practicable precaution has been taken to secure such a result and it has worked for the last sixteen years.

Motors are oiled once a week, on Saturdays; the slip rings are inspected at that time. Once a year, during July and August, all of the motors are taken down and thoroughly cleaned, including the brushes and slip rings. The inside of the stator and the rotor are then painted with air-drying varnish.

A. G. Dickerman, the master mechanic, states that it has not been necessary to have any motors rewound since he has been with the company as a result of this, except a few small ones which had been in service for 30 years and had become oil soaked. None of them have been scrapped.

In addition to this general scheme of maintenance certain motors require special attention on account of their service conditions. For example, the ½ and ⅓-hp. motors on the monotype casting machines are near the floor, where they are spattered with hot lead and oil, and as a consequence the slip rings are subject to more than ordinary wear and tear. These are therefore very carefully watched and new rings put on before there is danger of the old ones causing trouble. A few extra motors are kept on hand so that a substitution during noon hour or between shifts can be made without taking the machine out of service. New slip rings are made in the repair shop and can be put on in from one to 1½ hours.

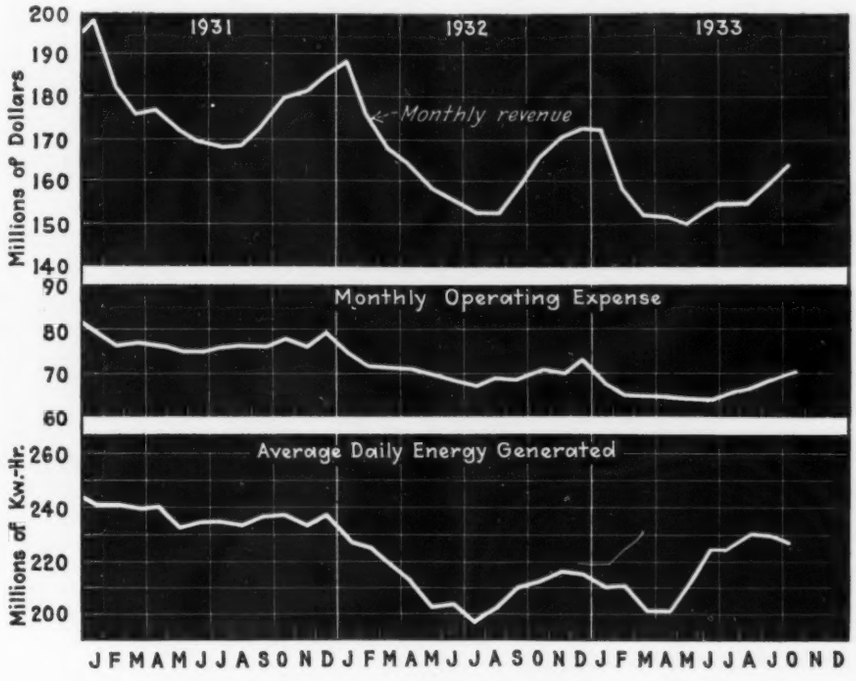
In the electrotyping department the conditions are also severe for the motors. This is because of the presence of sawdust and metal chips which get into the motors, and for this reason they are blown out regularly every week without fail. Otherwise the regular yearly cleaning is sufficient for all of the motors in the plant.

There is one other point regarding the motors with respect to which Mr. Dickerman has developed decided opinions from the standpoint of continuity of service. This relates to the drives. He feels that for presses and similar service V-belts are the best. This is because of their flexibility and the fact that in setting up the presses there is a great deal of "inching" done, which puts a severe strain on the drives. Unless chain drives are kept very tight, he declares, broken sprockets are likely to result every once in a while from "inching." With V-belts this difficulty has been entirely obviated and maintenance much simplified.

Output Grows; Revenue Lags

After registering moderate gains over 1932 for three consecutive months the October revenue of electric light and power companies missed last year's for the same month by 1.3 per cent, the estimated total on the basis of returns received by ELECTRICAL WORLD being $163,580,000. The usual seasonal rise brought a gain over September of about $3,500,000. Operating expenses increased over those of September by two-thirds that amount and over October, 1932, by 0.6 per cent.

Meanwhile the energy output of 7,036,000,000 kw.-hr. during October was 7 per cent greater than a year ago, the gain, however, being somewhat less than in September, when it amounted to 9.6 per cent, and sharply under the 13.8 per cent of August. Moreover the average daily production fell off to 227,000,000 kw.-hr. from 230,000,000 kw.-hr. in the preceding month. Production from water-power was off 2.5 per cent from a year ago, and the increase in the total had to be generated from fuel, this part of the energy being up by 12.5 per cent to a total well over that of recent months.


1931
1932
1933
Millions of Dollars
Monthly revenue
Monthly Operating Expense
Average Daily Energy Generated
Millions of Kw.-Hr.
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A J O N D

Obviously revenue is failing to respond to the increase in energy production over 1932 which began in May and rose to nearly 15 per cent in midsummer, whereas the revenue gained only 2 per cent as a maximum, in August. The contrast is evidence of a reduction in the average rate received for energy. The continued decline in the domestic rate, coupled with the fact that residential consumption is but slightly ahead of last year's, has cut the revenue from this branch of the business.

As appears from statistics published by the Edison Electric Institute, the growth in output has been due almost exclusively to larger sales to wholesale customers. It has therefore been sold at a price which not only is low but in addition has had a downward tendency.

This disparity between energy production and revenue is particularly evident in the Mountain region, where the output has been running 25 to 30 per cent higher than in 1932, while income has barely equaled last year's and in October was definitely lower. Other regions report similar disparities, if less striking. On the whole the effect of greater industrial activity has been to increase energy sales without any commensurate improvement in revenue.

Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1933	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
July	7,024,598	+14.7	2,622,724	+ 4.8	4,401,874	+21.7	1,922,000	+12.1
August	7,212,325	+13.8	2,702,735	+12.8	4,509,590	+14.3	1,982,000	+ 7.8
September	6,908,517	+ 9.6	2,714,098	+21.6	4,194,419	+ 3.0	1,994,000	+ 6.2
October	7,036,371	+ 7.0	2,435,391	− 2.5	4,600,980	+12.5	2,068,000	+ 1.2

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table II—Regional Revenue, Energy Output in October, 1933

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	163,580	− 1.3	7,036,371	+ 7.0	2,435,391	− 2.5	4,600,980	+12.5
New England	17,700	+ 0.3	523,670	+11.3	205,369	− 4.7	318,301	+25.6
Middle Atlantic	42,380	− 2.6	1,806,301	+ 3.0	477,033	− 8.5	1,329,268	+ 7.9
East North Central	37,210	− 1.6	1,657,511	+ 8.5	124,896	− 1.0	1,532,615	+ 9.5
West North Central	13,550	− 1.2	438,849	+ 2.4	88,532	+13.0	350,317	− 0.1
South Atlantic	18,370	+ 1.9	814,104	+ 6.5	394,358	−11.1	419,746	+30.8
East South Central	5,710	+ 0.3	262,912	+11.4	207,050	+13.8	55,862	+ 3.3
West South Central	9,720	+ 0.1	368,943	+ 6.6	5,822	+79.3	363,121	+ 6.0
Mountain	3,690	− 2.6	240,163	+30.0	194,452	+41.0	45,711	− 2.7
Pacific	15,250	− 1.2	923,918	+ 6.0	737,879	− 6.6	186,039	+132.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1933 Thousands	Per Cent Inc.	1933 Thousands	Per Cent Inc.
July	$154,860	+ 1.6	$65,590	− 0.1
August	154,930	+ 2.0	66,420	+ 0.8
Sept.	160,080	+ 1.5	68,060	+ 4.5
Oct.	163,580	− 1.3	70,450	+ 0.6

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Does not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

Diversion Thwarted, Unity Offered in New Meter Assemblies

SOME degree of energy diversion has always annoyed the electric utility industry, but the percentages in kilowatt-hours and customers involved during the last year or two has grown to such an extent as to cause real concern among executives and meter departments. Economic distress of the users, coupled with political assault on the companies generally, has salved the consciences of an increasing number of patrons until the revenue loss and the epidemic characteristics both warrant aggressive and summary measures to correct the situation. Individually the companies, working with the meter, seal and box manufacturers, have found more or less complete solutions to the difficulties, but their "name is legion." It has been hard to find among them a common denominator which would suit all zealots. In fact, no single solution can be pointed to as yet, but there are now two diversified, commercially available solutions that strike squarely at stealing and at the same time afford many if not all of the advantages incorporated into prevailing solutions found on individual properties. One big step forward is in the approach toward a universalized design that will permit control of costs through volume production as against the luxury costs that have often come with the custom tailoring indulged in the recent past.

Before launching into a discussion of the needed solutions it might pay to review what has happened to the watt-hour meter by way of evolution. It had lagged somewhat behind other pieces of electrical equipment in its swing toward standardization. Up to six or seven years ago the induction meter remained largely what it had become soon after its establishment by Shallenberger. Improvements had been made steadily, but they were minor as compared with those which began to transpire in 1926. Terminal arrangements had already been pretty well standardized, but it was then that load characteristics were improved and the meter given accuracy on loads to 250 and 300 per cent of nominal rated value. The performance, especially at low power factors, at varying temperatures was greatly improved. In the same period the losses were reduced and the multiplicity of normal speeds and watt-hour constants also reduced. Inside the meter there has been, therefore, a welcome approach to unity of characteristics and therefore a broadened range of serviceability. Incidentally, by these advances the conventional single-phase house meter unit acquired an outdoor potentiality and at the same time took on the capacity for becoming as good a power meter for household power use as the polyphase meter then later became in industrial and interchange service.

Mounting standardization progresses

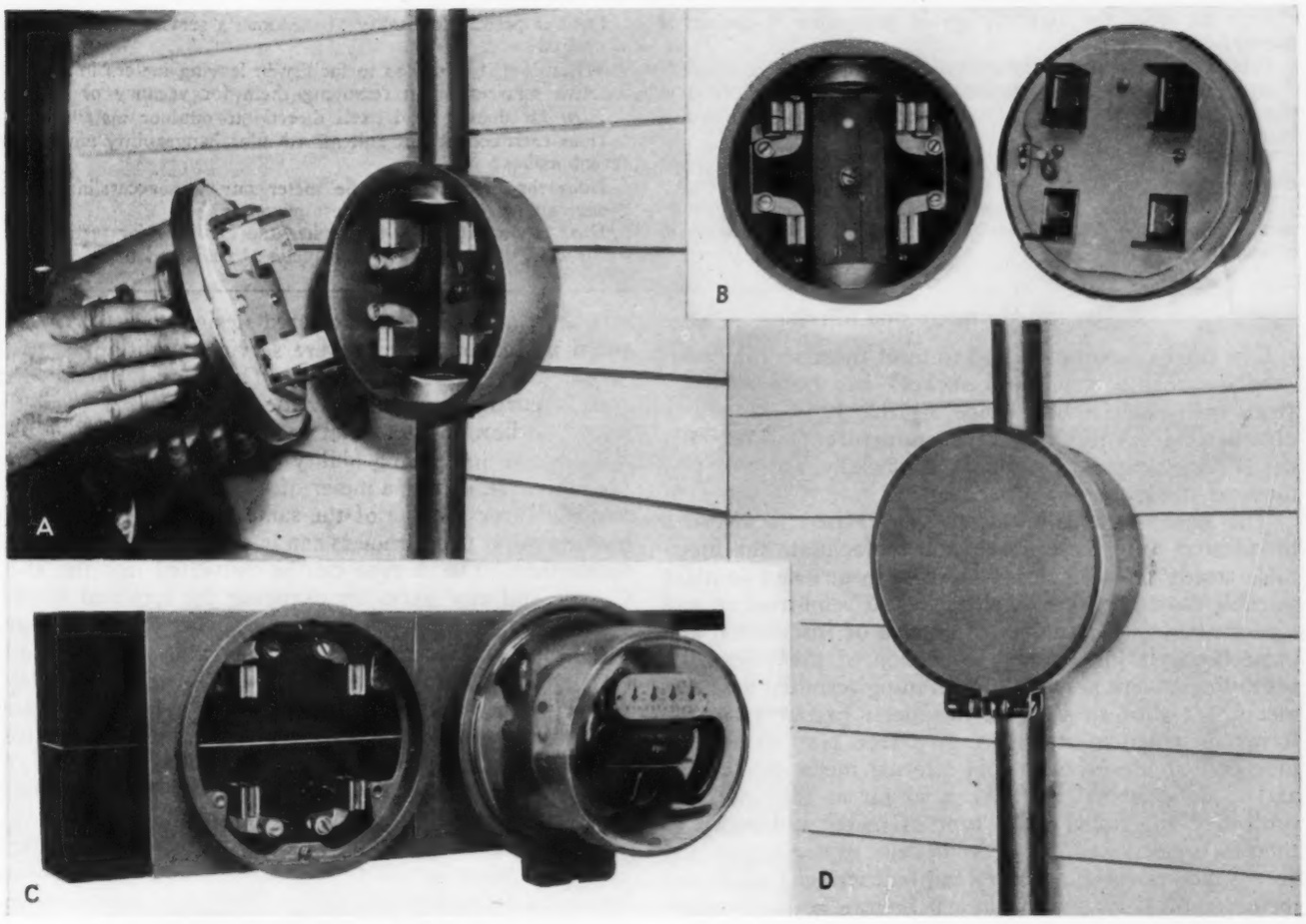
All this progress benefited the user of meters, but it contributed next to nothing toward unifying the ability of the meter to meet and combat the circumstances it encounters in the moral conditions surrounding its place of installation. Those conditions have become greatly aggravated during the depression and quite naturally the meter superintendents and specialists have improved their previous installation practices to meet the intensified problems. In this they have had the most helpful co-operation of box and seal and meter manufacturers. But unfortunately the result in one place has just enough difference from that in another place to create a multiplicity of solutions that will continue to defy unification or standardization until a spirit of accommodation is allowed to guide the evolution. No one will be quicker to admit this than the utility meter experts themselves. Each in the past has taken pride in the efficacy and simplicity of his scheme. Some have emphasized one factor, some another. These local solutions undoubtedly have had the sympathy and approval of company executives, but manifestly one great factor has been overlooked. That is the economic advantage that could come from sacrificing individuality and pride of local accomplishment to a nationalized design that would incorporate the best features of all these local answers. This result would pave the way for volume production, simplified stocks, interchangeability and a standardized installation.

Ruling objectives in the designs

Briefly, the meter attributes desired can be enumerated thus: Prevent energy diversion, afford safety to men and to service, take full advantage of the new sequence, be adaptable to indoor or outdoor metering and to the prevailing techniques of handling discontinued services. These are the things which are primarily recognized as bringing the need for mounting standardization into sharp focus.

At just about the time when order might have been evolved out of the confusion the channels for discussion of these problems have become badly disarranged through curtailment of travel and of group meetings. It is hoped, therefore, that an assembly here of the objectives and a discussion of the two alternatives which are to be generally available for the immediate future will help to clarify the situation. It may be too much to hope, however, that we shall have a rapid convergence to a single concept to which all can build and buy meters regardless of when, where, how and how often they are installed, tested and replaced. There are sure to be some who will adhere to their past loves and be critical of any horizontal coalescence of the objectives and the design features to accomplish them. There will be some, too, who will be critical of any high degree of standardization merely because standardization always runs the risk of thwarting progress.

Utility meter committees, spurred by the advent of these designs and the urgent circumstances which pre-



Westinghouse meter detachable from socket

(A) Base provided with jaws to engage blade terminals on back of meter case.
(B) Meter can automatically be by-passed to give customer continuity of service while meter is out of socket.
(C) Scheme adaptable to flush mounting on channels for group installations.
(D) Sealed and blanked-off outdoor service.

cipitated them, will undoubtedly study them critically in the light of the defects of existing practices. Already two of these committees have enunciated the dominant principle that standardization was not only desirable but imperative. They have resolved that there should also be a high degree of interchangeability between all makes of meters and that designs should be equally suited for indoor or outdoor installation and to both the old and new inclosed forms of wiring. Further broad and comprehensive analysis will be engaged in with a view to placing the industry on record concisely as to what current conditions and those of the future will demand of protective meter mountings. It is to be hoped and expected that the committee will also clarify the economic factors that govern the most profitable salvage of existing meters, most logical employment of independent box inclosures, most justifiable engagement in long-range programs that will take advantage of the advances in protective and administrative features of meter installation design.

Many utility departments affected

In several respects this whole situation has become an executive problem transcending the prerogatives and responsibilities of the meter department. Fundamental company policies as to accounting, billing, discontinuance, inspection, service connections are involved. Public relations factors are involved because the meter is and will remain the symbol of physical junction of the company with its customer. Public relations are suffering a bit now because metering practices and others associated with them in the carefree days of the past sufficed well enough then, but do not function at all smoothly under present conditions of stress. This stress is noticed mostly in the slump in moral reaction of the customer to his responsibility to the utility and to the other customers. Finding the economically right answer to the method, place and mechanism of installing, testing, protecting and removing meters is a big part of the necessary solution. The rest is in shaping the administrative program to derive the greatest benefits from a simplified technical job in designing the correct assembly of meter, cover, base, box, conduit, switch, test block and sealing facilities that are available.

Many requirements to be met in acceptable assemblies

Disclaiming any intention here to confirm or disparage any particular design, the object of this presentation is, on the contrary, to enumerate the various requirements of service and to show how two distinct commercial solutions aim to meet all these requirements. The decision in the end rests with the purchasers. They will have to place the candidates on the examination stand and let the answers to some such questions as the following influence the decision for or against the diploma:

How far does the assembly go in preventing diversion of energy?

Which of the artifices encountered will it absolutely obviate?

Are various degrees of proofing against diversion afforded in the program and are the constituent units interchangeable in this respect?

Do any of the assemblies give positive protection against entering the meter by way of the cover?

Does the assembly afford ample safety to service to metermen who test and detach loaded meters from live circuits ahead of switch and fuses?

Does it permit continuity of customer's service during testing, if desired?

What does it afford as to facility in leaving meters in place on inactive services or in removing them for vacancy or change?

How far does it lend itself directly to outdoor installation?

Does each constituent unit afford interchangeability among different makes?

Does the design make the meter any less accessible to the meterman for inspection or test purposes?

Does it simplify and standardize the facilities for testing?

To what degree can existing meters be adapted to the scheme?

Socket-detachable meter one offering

One of the designs devised to meet these requirements (the detachable meter and socket) has been available from one manufacturer since April. It is now to be obtainable from three meter manufacturers. The other design is shortly to be announced officially, sponsored by three of the meter manufacturers.

The socket-detachable meter was devised to afford a broad answer to these desiderata, to facilitate the inevitable steady replacement of obsolete meters and to make possible the adaptation of all makes of semi-modern and modern meters to a universal scheme of installation and protection. It involves no restriction of the volume of prevailing covers nor of the prevailing terminal arrangements. It aims to separate the meter proper from the terminal structure and thus give free play to further independent improvements in internal meter mechanism and to the terminal features in so far as they perform protective functions. This type of meter and socket is therefore calculated to accommodate past, present and future meters (as far as they can be foreseen) up to and including 50 amp. An additional feature is that it offers an opportunity for utilities to readapt their present relatively large stocks of inactive meters to a unified program of new and renewed installations.

Interchangeability of components is a positive feature. Parts are available to adapt all makes and types of meters since 1914 to the new detachable design. Semi-obsolete meters of all types can be adapted to the new socket for additional years of service where this appears to be an economical procedure. An entirely dead-front sequence is afforded as to both meter and (portable or permanent) test jack in the testing procedure.

Among the structural details may be mentioned the fact that the jaws in the socket base may be swung to accommodate either a horizontal or vertical conduit connection. The meter bayonets cannot be inserted improperly and thus cause a short-circuit across the live service jaws. No sealing compound is required between the glass cover and the cover ring, a hard fiber gasket serving to keep moisture out. The sealing ring secures the cover, the meter base and the socket base at a single joint. Provision is made for short circuiting and grounding customers' load wires in case of disconnect. If it is not desired to leave meters on idle services a blanking plate can be provided and held in place by the sealing ring.

Interchangeable units feature second design

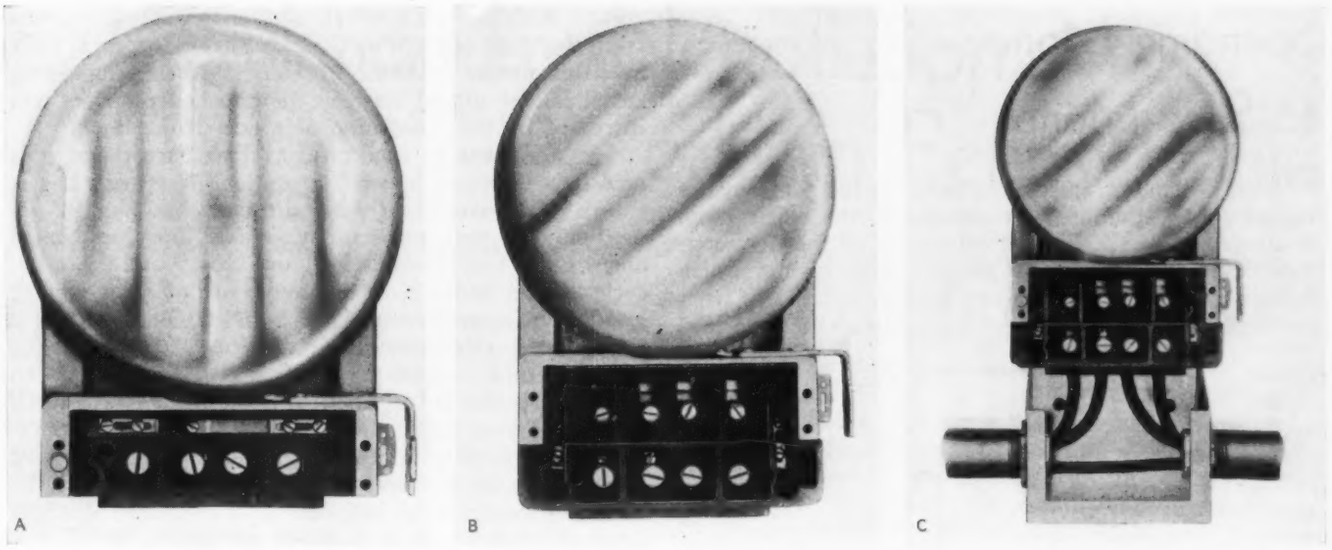
Three of the meter manufacturers have joined in developing and sponsoring a second design which embraces a comprehensive line for all desirable forms of installation. Three sub-types have been provided for: A, for standard house-type installation corresponding to present types of meters; B, with safety disconnects (which also provide test facilities) incorporated into the terminal chamber, and C, a full-armored design to afford maximum protection under severe service conditions in conjunction with conduit wiring. The A and B types can also be conduit-connected by the use of a die-cast aluminum pull-box and terminal cover.

Complete interchangeability of parts is assured. It is possible to substitute a meter of a given type made by one manufacturer for one of the same type made by another manufacturer; also, meters can be changed from one type to another. The A type can be converted into the B or C type and vice versa by changing the terminal blocks. External, mounting and terminal-spacing dimensions are to be the same for all meters of the same sub-type made by all three manufacturers. External meter condulets, pull boxes, connection blocks, terminals, glass covers and terminal covers are interchangeable among the three manufacturers. Meanwhile nothing has happened to disturb the internal electrical characteristics for which the meter of each manufacturer is noted.

While engaging in this joint development advantage has been taken by all three participants to incorporate incidental improvements that will thwart corrosion, infiltration of dirt and moisture, and the malicious insertion of detents. Sealing the terminal cover seals the glass cover, or it can be sealed separately. Test connections can be made to the terminal screws by means of Universal test clips. The hanging lug may be "blind" or extended, by reversing it, to facilitate mounting in existing types of boxes.

In this set-up the B type meters are designed primarily for installation where safety disconnect features are desirable. They are identical with the A type except that two terminal blocks having the safety disconnect features are substituted for the one block of the A meter; the B meter is only $1\frac{3}{16}$ in. longer than the A. The safety disconnect features in the B and C types consist of two rows of four terminal screws; the upper row are differential (right- and left-hand) screws with self-locking threads. There is, of course, no need of interrupting the loaded circuit at these points for testing purposes because load jumpers can be clipped to the heads of the bottom row of lead-in screws. The same conduit pull-box can be used for both A and B meters, but of course different terminal covers are required in the two cases. Single-point sealing is effected by means of a sealing bar threaded through the heads of the sealing screws. The terminal covers securely lock the sealing clip and cover.

Type C is designed to meet the most exacting requirements demanding a full-armored job. The meter is detachable and is equally accessible as the A or B for testing in place. Except for the protruding portion of the glass cover the meter is fully protected by a die-cast aluminum case held in place by two rugged sealing screws. If desired a frangible glass seal can be snapped into the recess surrounding the lower seal screws. The



General Electric-Duncan-Sangamo three-unit design

(Meter mechanism not shown)

(A) Type A, conventional house pattern.

(B) Type B, safety disconnects and test facilities supplement simple terminal chamber of type A.

(C) Type B, with die-cast aluminum pull-box for inclosed wiring.

(D) Type C, die-cast box mounts meter over conductor loops.

(E) Type C with cover in place to show full armor protection.

C meter is identical with the B meter except for the connection block, which in the C sub-type extends in back of the meter and is designed so that the leads come into the terminals from the top and behind the meter. B type meters can be converted to C type meters by changing the connection block and providing a die-cast case. Either the B or C assembly constitutes a complete unit comprising all necessary protective and test facilities.

Half the present meters are obsolete

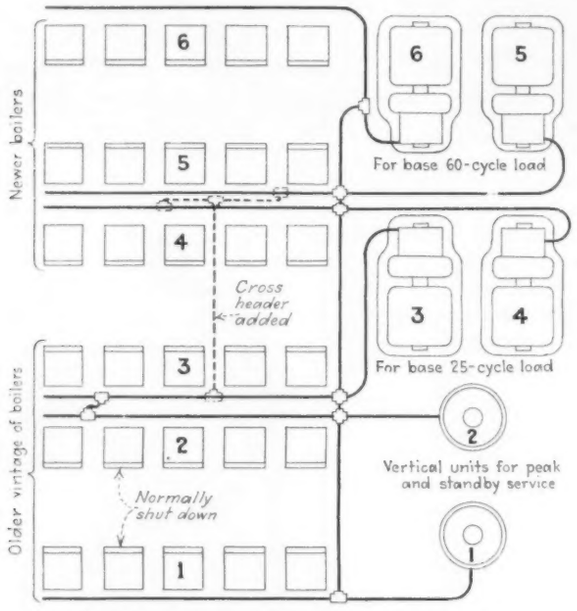
The foregoing describes two somewhat rival offerings for meeting the industry's needs as appraised by the manufacturers. From the purchasers' side the Edison Electric Institute committees on meter mounting and energy diversion are also appraising these needs, with simplification and economy being given timely weight. Consolidation of the gains on all sides is next in order, and then there should be concerted effort in carrying to completion the job of having meter installations right in every respect. Clearly the common objective must be to accomplish the needed security and interchangeability of meter installations with the maximum of simplicity and economy. Maybe a single preferred standard of practice among purchasers and manufacturers will have to be accomplished before the solution can be called final.

Meanwhile the current developments are well synchronized with the statistical calendar of the watt-hour meter art. More than half the 24,000,000 electric meters in service today are more than seven years old and antedate the newly incorporated electrical characteristics already detailed. Practically three-fourths of a million are twenty or more years old. The remaining 11,000,000, to varying degrees, contain the improvements that have been made since 1926 in accuracy characteristics, standardized terminal arrangements and dimensions, and partially standardized speeds of rotation and test constants.

At that point practically all uniformity vanishes, especially as to features which meet the broader needs of management in simplifying and unifying the whole administration of the rendering of a metered service immune to pernicious tampering. Regardless of the rate of business recovery, the next ten years will entail an extensive modernization of metering technique. The present status of each utility could well be canvassed in the light of long-time economics to determine when and how fast that start should be made to take advantage of the benefits afforded by the forward strides in the internal and external characteristics of watt-hour meters.

Spending Money to Save Money

"Paid for in less than six months" is the performance record of an additional crossheader in the boiler room steam piping of the Fisk Street station of the Commonwealth Edison Company, Chicago. This saving, which expresses itself in coal economy, is representative of what can result from studies of present plant and system load



Additional steam header to save coal.

conditions and, more important, from acting on the conclusions thus reached, instead of just pushing them into the file and then forgetting about them.

In Chicago are two systems, 25 and 60 cycle. The former supplies a large part of the d.c. load in the downtown district and of the transportation load. Load growth on the 25-cycle system is restricted, so far as is possible, and for a number of years past it has been the policy of the company to make no additions for it. In these years there have been many improvements in generation practice, but not sufficient to justify the expense of complete redesign and new equipment in the 25-cycle generation facilities. The result is that these facilities include boilers that by modern standards are not among the most efficient. However, the 60-cycle plant has been kept up to the minute of development and its boilers, therefore, show a considerable margin of efficiency over those of the 25-cycle plant. When, previous to present business conditions, the total system load was at normal, the boilers installed for 60-cycle generation were needed for that load. But since 1930 the 60-cycle system has suffered a greater load decrease than has the 25-cycle, with the result that boiler capacity formerly necessary for 60-cycle generation became idle. This capacity is more efficient than that in the 25-cycle system. Why not use it for 25-cycle generation?

Formerly Fisk Street operated in effect as two separate plants, 25-cycle generation in the older part, section A, and 60-cycle in the newer, section B. To make steam from the more efficient modern boilers of section B fully available to the turbines of section A the connecting steam header piping between the two boiler houses was increased by the installation of a new 16-in. line.

This idea was so successful at Fisk Street that it is now being applied in another station, Northwest, as is shown in the sketch. Vertical turbines Nos. 1 and 2 are used only for peak and standby service. Turbines Nos. 3 and 4 carry base 25-cycle load and Nos. 5 and 6 are 60-cycle. Boiler banks Nos. 1, 2 and 3 are of older vintage and less efficient than banks 4, 5 and 6. Banks 1 and 2 are normally shut down, but No. 3 must be operated for turbine No. 3 because the existing crossheader between the boiler banks is too small to allow bank No. 3 to be shut down when turbine No. 3 is running. Yet, for economy, bank No. 3 should be on the standby list with Nos. 1 and 2. So another crossheader, as shown dotted in the sketch, is shortly to be installed. It is estimated that this job will pay for itself in eighteen months.

▼

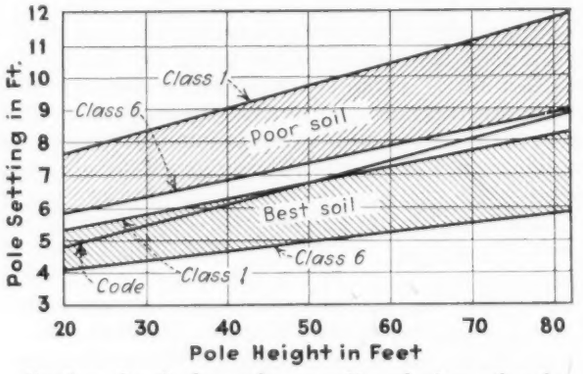
Depth of Setting for Maximum Pole Strength

By B. E. ELLSWORTH

Iowa-Nebraska Light & Power Company, Lincoln, Neb.

That maximum pole strength be developed before yielding of the soil in which the pole is set is the requirement of the National Electrical Safety Code. The code recommends certain setting depths, but they are based on averages of soil conditions, and it is possible in any particular case, if the code recommendation is rigorously followed, that a pole may be set too shallow to develop its full strength or more deeply than is necessary in other cases. The accompanying graph, plotted from actual test results, shows how the code recommendation, which is a straight line of averages, may be modified according to the class of pole and the character of the soil in which it is set.

It is to be noted that a class 1 pole in poor soil must be set deeper than the code value in order to develop its strength. Also, a class 5 or 6 pole set in clay or the best soils may be set one or two feet shallower and still develop the full pole strength. This foot or two if applied to additional clearance above ground may help materially in lengthening spans where the conductor sag or ground clearance is the limiting feature.



Setting depth depends on soil and class of pole

Regulation by Negotiation Works in Pennsylvania

By GEORGE W. WOODRUFF*

Member Pennsylvania Public Service Commission

THERE are scores of subjects concerning utility regulation as worthy of consideration as informal conference, but none is more likely to bring prompt and economical regulatory results if put into use with reasonable patience and wisdom. It seeks to substitute regulation of rates by informal procedure for the orthodox formal procedure laid down in statutes and by court decisions.

To make adequate comparison of these procedures we must first briefly but clearly determine what formal procedure is required before there may be an enforceable order looking to utility regulation:

First—Our state statutes require almost uniformly—(a) Institution of a clear-cut complaint against service, practices or rates; (b) public hearings at which complainants and respondent utilities may have opportunity to present evidence, and cross-examine witnesses; (c) reasonable opportunity to discuss evidence and law in briefs or oral argument; (d) clear findings of fact and law by the commission; (e) opportunity for appeal to the courts.

Second—As declared by the United States Supreme Court in the case of Ben Avon Borough vs. Ohio Valley Water Company, 253 U. S., 287, it was decided that every utility, at least when its property and earning rights are at stake, must be given its day in court, which, as the decision explains, means nothing less than to have a court upon appeal, or by injunctive proceedings, form its own judgment as to both law and fact, independently of the findings made by the public service commission.

After such formal procedure is concluded, and not otherwise, effective compulsory orders may be enforced, but such procedure is fraught with almost prohibitive delay and expense, especially when substantial public interest is involved. Only eight months ago a Pennsylvania gas rate case instituted by a number of cities and boroughs was disposed of by the commission after a delay totaling eighteen years. The first step in this formal procedure was taken in 1917, and there were appeals to the courts and remands to the commission for taking further evidence on new ideas of determining gas utility valuation. This probably cost the complainants, the state and the utility a total of more than $200,000, all of which must be absorbed by the public in the long run, and the result was merely a dismissal of the complaint, because the record at this late date does not reflect conditions which probably would warrant an order reducing the rates. Volumes could be written on the futility of attempting to regulate rates by formal procedure.

Time shortened with equal results

As to regulation by informal conference or negotiation, I believe it has great and fundamental value. I am sure that the above-described gas complaint could have resulted in at least a 10 or 15 per cent reduction of rates in less than four months by informal conference, involving one-fiftieth of the time and surely only 1 per cent of the cost. If so, the consuming public would have saved, in addition to the heavy cost of formal procedure, a reduction in rates, over a period of nearly eighteen years.

Formal procedure is crystallized in statutes and court decisions and cannot be varied to suit special conditions. Its delays and cost are inescapable. Informal negotiation, on the other hand, is something which must depend on the circumstances of each case. The main features of such informal action as they have been used in Pennsylvania during the last eighteen months are:

Sometimes the opportunity to act comes suddenly and there is no time to prepare. In such cases one or more commissioners sit around the table with the committee of complainants and the representatives of the utility and lend the good offices of the commission as mediator. Thus in one case this year the only conference needed lasted from 2 o'clock to 6. There was strong animosity at first. The commission procured a cards-on-the-table explanation by the utility of a deal affecting its property ownership, which removed all bitterness, and the parties departed for a veritable love feast with the gas rates reduced voluntarily from a flat rate of 65 cents per thousand cubic feet to a sliding scale of 60, 55, 50 and 45 cents per thousand. Another time the same borough authorities called on the commission to act informally as a mediator in their complaint against electric rates, and by the good luck that a franchise, limited to 25 years, was lapsing soon, a material reduction in rates was obtained not only for that borough but for the entire district, averaging some 50 miles in diameter. This took only three conferences.

This brings us to the broad general principles which

To Be Pro-Public Is to Be Pro-Utility

To set at rest any misconception of his commission's objectives, Chairman Woodruff prefaced his discussion with the following unequivocal assertion:

"I am not now and never have been and could not ever become anti-utility. On the contrary, I am earnestly pro-utility, wishing all utilities the highest success. This to me means that they shall, through efficiency and close attention to their high public duty, succeed splendidly in giving good service to the public, without discrimination and with the reward of a full fair return to themselves. Without such success and such fair profit a utility cannot continue to serve the public well. Harm to the utility is harm to the public. If we are pro-public, we must for that reason be equally pro-utility."

**Excerpts from discussion presented at annual convention of National Association of Railroad and Utilities Commissioners, Cincinnati.*

may be assumed as a basis (or an excuse if necessary) for informal negotiations looking to voluntary rate reductions:

First—We have been falling short in regulation because of the failure of formal procedure due to delays and cost beyond commission control.

Second—The commission exists primarily for the purpose of regulating utilities, and should use all means within its reach to accomplish that end.

Third—Therefore, if we can't effectually regulate by use of formal procedure and resultant enforceable orders, we must try persuasion and informal appeals to the better nature of the utilities, but since such appeals affecting the pocketbook are, when based on good nature alone, proverbially futile, can we possibly find and rely on any grounds other than charity?

Fourth—Surely we can. We believe and know that utilities, both morally and legally, have the right to charge enough to make a fair net return, *but we are equally aware that they have the right to make only a fair return.* The emphasis on "only" is intentional.

Fifth—That being the case, commissions, when strongly convinced that any utilities under their regulatory control are making more than a fair return, are bound to try informally to convince them of their legal duty to reduce rates voluntarily.

Sixth—To that end the Pennsylvania commission has adopted the practice of having a rough but careful examination of the books and sworn reports of the utilities made by our accountants, giving the companies largely the benefit of doubt as to value and usefulness of physical property, propriety of operating expenses charged, going concern value, operating cash capital, and the like, and if we find that they are making a net return of more than, say, 7 per cent we informally present our figures to them and urge reductions.

Procedure greatly expedited

The Pennsylvania commission adopted this method in March, 1932. However, with the small but efficient force available under the commission's appropriation, we have found it averages more than two months even to get the rough figures complete for the larger utilities, but this work is not lost for use in future possible formal complaints by the commission on its own motion, or assistance to other complainants.

As soon as the figures are ready they show whether there is *prima facie* evidence that the company in question has been getting more than a fair return for, say, the last five years. If so, and that has been the result in practically every case studied, a copy of the accounting report is sent to the company involved, with request to meet with the commission for informal conference on a date named.

Thus far no company has actively tried to dispute, or argue against, the figures presented. Instead, they reserve the right to dispute and call attention to the growing losses in gross income, due to business depression, and resultant greater percentage loss of net return; to the danger of destructive taxes, state and federal; to the transfer of the 3 per cent tax on bills from customers to the company; to the NRA rules and consequent probable increase in operating expense, and to other actual or imaginary dangers.

Thus far results from all forms of informal negotiation have been remarkable, in the light of the above arguments, and of the fact that any reduction based on informal negotiation must be voluntary. Pennsylvania's experience has brought out encouraging facts in favor of informal negotiation, far exceeding my personal expectations, particularly the following:

1. Not once has a company tried to argue against being called into such conferences.

2. At no such meeting has the president of the company been absent. Sometimes the president of the holding company attended also. I have yet to see this happen at formal hearings. These are left to the attorneys and expert witnesses, who often succeed in making black look white and white black.

3. Contrary to experience with such prejudiced witnesses at formal hearings, I have never heard a representative of a company at an informal conference tell anything which did not appear truthful or which was found untruthful.

4. Never thus far, in spite of unprecedented bad business conditions, has any company refused to make some reductions. They have sometimes urged delay to see how business and the NRA might come out. When the reductions offered seemed meager they have sometimes promised to come back for further conference the moment their business might begin to show a return toward even the 1930 or 1931 normal. The dollar and cents reductions voluntarily made by all utilities as a result of informal conferences in Pennsylvania, for a trial period of about fifteen months, has been somewhere around $4,000,000 per year, which if capitalized, even for a five-year period, represents capital saving to consumers involved of $20,000,000, and the surface has not been deeply scratched.

5. The most surprising thing to me, however, is the fact that, except in certain cases of quick and invited mediation, the consumers who profit by this successful informal work are either totally indifferent, or in some cases find fault with results as "worse than nothing at all."

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60-Watt Lamps Lead Boston Edison Purchases

More than five times as many 60-watt lamps were purchased in the year ended April 30, 1933, by the Boston Edison Company than in any other rating, the 25-watt size running second in popularity. The ten leading ratings and lamp types in their order follow:

Order	Type "Mazda"	Number Lamps Billed	Rating
1	A	2,536,800	60-watt, 115-volt, frosted
2	A	454,800	25-watt, 115-volt, frosted
3	A	444,960	100-watt, 115-volt, frosted
4	A	172,200	15-watt, 115-volt, frosted
5	C	114,576	150-watt, 115-volt, clear
6	C	69,456	200-watt, 115-volt, clear
7	B	69,000	10-watt, 115-volt, clear
8	A	59,760	50-watt, 115-volt, inside frosted
9	C	57,540	6.6-amp., 80 cp.
10	A	49,320	40-watt, 115-volt, inside frosted

The above represents a reasonably satisfactory picture of the prominence of the ten leading sizes since free renewals form a part of the rate structure with the exception of the 25-, 15- and 10-watt lamps, which are retailed to customers at 8, 10 and 13 cents respectively.

Observations on Ten Years' Operation of Supervisory Control

By LESLIE R. HICKS*
Consulting Electrical Engineer, Rochester, Mass.

MORE THAN ten years ago the electrical engineering department of C. H. Tenney & Company installed the first distributor type of supervisory control system for the Malden Electric Company, which supplies electric service to a large part of the suburban section north of Boston, Mass. This system started with one and shortly afterward two substations operated over the supervisory from the system operator's board at Malden. These were two of the first a.c. distribution substations to use the reclosing relays on the oil circuit breakers. The supervisory was added to the reclosing feature to provide the system operator with complete control of these substations. The three automatic reclosures of the breakers gave the operator time to oversee all the switching operations when a serious storm caused a number of feeders in different substations to open. Since the first two substations were put in operation there have been three more added, so that there have been five in operation over the supervisory for more than five years in the Malden Electric Company's system.

An inspection of the operating record of these substations shows some interesting data. During the first two years there were many faulty operations and a few complete failures of the supervisory to function. Each trouble was carefully analyzed. Many of them involved the operation of the synchronous distributor. The distributors failed to keep in step because the clutch slipped more than it was designed to and so put the distributor brushes on the wrong segments. The cause was found in the kind of material used to line the clutch, which wore out faster than was anticipated. A different kind of clutch lining increased the life of the clutch very much. Uneven brush wear on the distributor copper brushes caused them to bridge the wrong segments and so give more signals. Woven wire brushes improved this. The governor on the distributor motor grounded enough to permit a small leakage current of sufficient value to operate the polarized relays incorrectly. This ground was caused by the accumulation of fine carbon and metallic dust on the insulated studs in the motor supply circuit which was run through the centrifugally operated switch, allowing the small leakage current to pass. This was corrected by a new governor design that provided greater leakage distant on the insulating studs and a wearing material on the switch which did not accumulate as much dust as on the original governors.

A number of other sources of leakage or "sneak" current were found and rectified. One was the leakage from an old storage battery on the system which occasionally caused the polarized relays to operate incorrectly until it was found and cleaned up. No case of false operation from stray street railway currents has ever been recorded nor has any induced alternating current caused any trouble. There have been three cases of cable trouble in ten years—one was a bad section of cable, one a poor joint and the third case was when the supervisory cable was cut in two by an air drill driven through the duct line by a workman of the street railway excavating near the duct line.

Formerly electrical engineer of C. H. Tenney & Company.

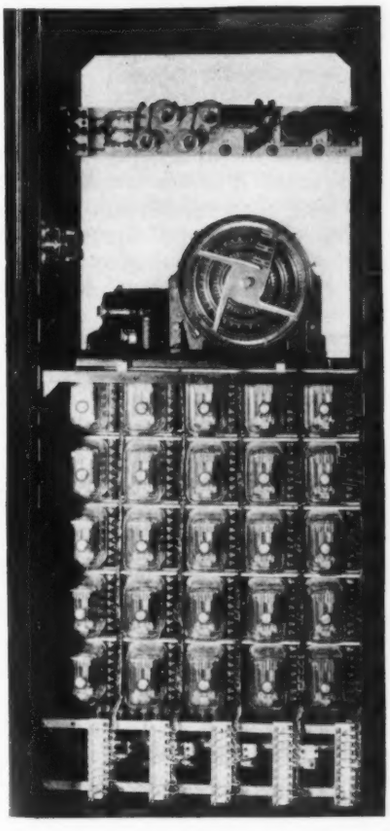
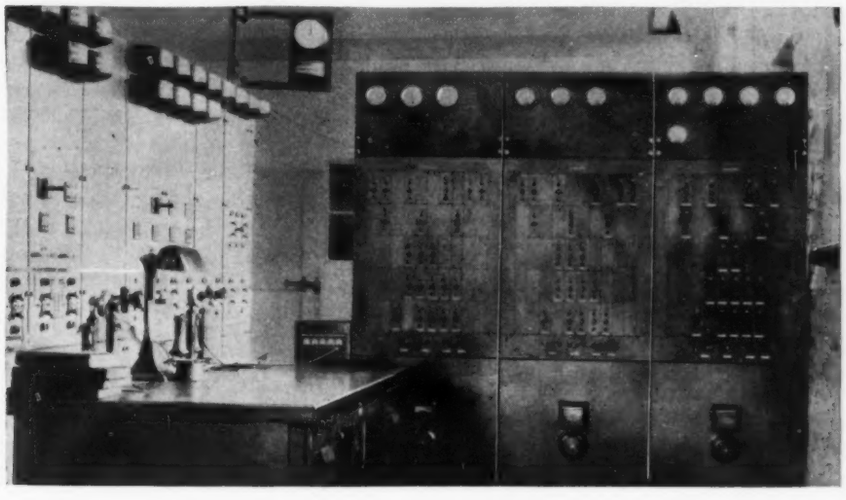


Fig. 1—Original distributor and polarized relays in cabinet designed for 50 switches

Shows the original solid copper brushes which caused trouble, also the governor on the motor on the left-hand end of the distributor.

Fig. 2—System operator's desk and supervisory control panels



All the early troubles outlined were overcome and after two years' operation they become negligible. The most important thing the operating and maintenance men had to learn at this time was that this type of equipment required much more careful attention and handling than they had been accustomed to exercise on power equipment with which they were familiar. It early became evident that a definite routine system of testing and inspection must be adopted properly to take care of the equipment. The telephone and telegraph companies had carried on such tests and inspections for years and the supervisory system used much the same equipment.

The records of operation for ten years show that there has been approximately 85,000 switch operations with 82 failures of the supervisory system either to operate the desired switch or to give the correct light indications. This is approximately one failure per 1,000 switch operations. The first five years shows 67 failures in approximately 38,000 switch operations, or about one failure in 570 switch operations. During the last five years there has been very little trouble; the record shows only fifteen failures of the supervisory in approximately 47,000 switch operations, or about three failures in 10,000 switch operations. The large number of switch operations on this system is due to operating the sixteen sets of series magnetic arc and incandescent lighting equipment in these substations over the supervisory. In addition to the regular night and morning operation of the street lighting switches, the company requires one live test at noon every day and one at 5:05 p.m. every evening when possible, or for about eight months in the year. The line crews may also require live tests after repairs have been made.

The most expensive piece of equipment to maintain in this supervisory installation has been the distributor. Since it runs all the time, there are many parts that wear out. This has been recognized by the manufacturer who has developed the synchronous selector, which operates only when the system operation requires. This eliminates the maintenance cost of the distributors. The saving at Malden in changing the distributors over to synchronous selectors seems hardly warranted, for it would mean retiring the unused portion of the distributor life, the installation of additional relays and control keys as well as the synchronous selectors. In a new installation, however, the synchronous selector will prove the cheapest and best.

Inspection and maintenance of the Malden supervised substations is done by two plant electricians under the direction of the company's electrical engineer who has charge of substation operation and maintenance. The labor cost of maintaining the supervisory equipment in this company's five supervised substations has been less than $3,000 per year, or $600 per substation per year. In these five substations are installed 71 oil circuit breakers, five air-break motor-operated 22-kv. switches, 46 induction feeder regulators, sixteen series magnetite arc and incandescent street lighting equipments and transformer capacity of 30,250 kva., 22 kv./2,300/4,000 volts, all controlled and operated by the supervisory control system. These substations are all designed for an ultimate transformer capacity of 10,000 kva. each.

The installation cost of this supervisory system was less than $50,000 above the cost of the reclosing equipment which had either been installed or would be before the supervisory went in. If the usual force of substation operators had been maintained for these substations on three eight-hour shifts with one or two spare operators to fill in, it would require sixteen or seventeen men at the least to operate the system at an expense of from $25,000 to $26,000 per year. Furthemore, substation heat is a large item in New England where there are operators. In these supervised substations a temperature of about 55 deg. F is maintained in the coldest weather by a one-pipe furnace or by gas heaters controlled by thermostats. Operators would require a temperature of 65 to 70 deg. F. at a greatly increased cost for fuel. From the facts submitted it is evident that this supervisory installation paid for itself in from two to three years.

Electric light and power companies have not used supervisory control to the extent that they might. Wherever the service requires an operator in a substation on a system where there is a central operating point a material saving can be made in the cost of operation by the installation of supervisory control. The initial investment can generally be absorbed in less than three years through savings in operating expenses. The experience of the Malden Electric shows that this can be done. Furthermore, the last five years' record of this company indicates as great reliability of the supervisory as is found in many manually operated stations where equally careful records of operations are kept. The important thing for the successful operation of a supervisory system is to have operating and maintenance men who will give careful attention to systematic routine inspections and tests and will replace worn parts before they cause trouble. Results obtained by the Malden Electric Company show what can be accomplished.

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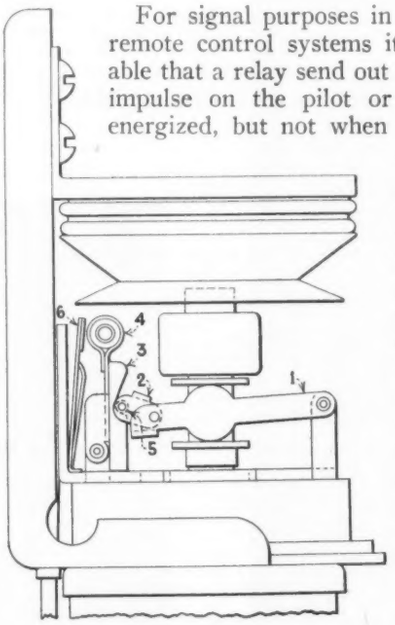
One-Way Relay Contact

By J. C. WOODS

Engineering Department, Commonwealth Edison Company, Chicago

For signal purposes in supervisory or other remote control systems it is sometimes desirable that a relay send out a momentary current impulse on the pilot or signal circuit when energized, but not when returning to the de-energized or normal position. A device for accomplishing this purpose which has found considerable application on the system of the Commonwealth Edison Company is shown in the accompanying sketch. The upward movement of the coil armature raises the lever arm (1); the hinged member (2), held by a stop from turning downward, moves across the cam (3), forcing the mem-



Contact while opening but not while closing

ber (4) to close spring contact (6) momentarily until roller (5) at end of member (2) passes upper end of cam (3) and permits member (4) to be returned to its normal position by a spring. On the return movement of the armature no contact is made because the hinged member (2) is free to turn up and thus exerts no pressure against the cam (3).

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Better Understanding of Insulating Liquid Failure

The electrical behavior of liquids is about as varied as any phenomenon encountered in the whole field of electrical engineering. This is due to the facts that insulating liquids are commonly of very complex molecular structure, that moderate amounts of moisture, air or electrolytic impurities have pronounced effect upon the electrical properties and that it is usually impossible to control or to determine quantitatively the content of such impurities. Generally speaking, however, the liquid has better electrical properties the more free that it is of such foreign substances. Conductivity and dielectric loss are reduced and dielectric strength is increased. However, even in the purest liquids, as obtained by filtration, evacuation and distillation, irregularities still occur, and until quite recently it has been difficult to reach certain conclusions as to the nature of conductivity and loss and the mechanism of electric failure.

The past two or three years have been outstanding in the production of experimental results based on more searching investigations and the picture of the origins of the electrical properties of liquids is now very much clearer than it has ever been before. Some of this work has been done in this country, as by Clark, Race, Whitehead and Wyatt. Important theoretical studies have been carried out abroad, as by Edler and Zeier, Inge and Walther, Nikuradse, Schlegelmilch and Schumann. The conductivity of such liquids is definitely ionic in character and the influence of impurities both on conductivity and loss is very well understood. For very pure liquids the conductivity has all the features pertaining to conductivity in gases, including the phenomena of saturation and ionization by collision. The mechanism of breakdown has been one of the most difficult to uncover.

There is now much evidence to indicate that the immediate cause of breakdown is the formation of minute gas bubbles within which gaseous ionization starts and advances as a fast moving ray or point, with a region of high stress and liquid ionization immediately in front of it and leading ultimately to breakdown. The moot point, however, has been as to the origin of the gas. One viewpoint has been that the oil itself and the electrodes, even when carefully purified, contain some gas and that this gas is somehow liberated under electric stress. Another view is that with increasing stress either new ions are liberated at the electrodes, increasing the conductivity, or that the conductivity already present is sufficient in connection with the stress to cause internal losses, and so local heating sufficient to vaporize the oil and give the necessary ionization space. Any impurities in the oil facilitate breakdown by constituting focal points for the liberation of gas at lower temperatures. At present the most careful and thoroughgoing researches support the latter view of the mechanism of failure.

The results are of especial interest as related to oil-impregnated cable insulation. In such cables, if there are any gas spaces present, as frequently result, for example, from expansion and contraction in service, all of the necessary elements, namely, high voltage and gaseous ionization spaces for progressive deterioration under stress, are already present. However, in cases where such gas spaces are absent, as in thoroughly impregnated condensers, or in cables of the oil-filled type in which the occurrence of gas spaces is largely suppressed, the much more probable cause of ultimate failure is oil vaporization due to increasing internal loss and temperature.

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READERS' FORUM

Contractor's Point of View

To the Editor of the ELECTRICAL WORLD:

Since you raised the question in your issue of November 18, 1933, "What of the Contractor?" and in the same issue you published Mr. Wellman's paper, "The Inspector Looks at the Contractor," we hope that you will find it convenient to give the contractor's viewpoint and reply some space in your valuable paper.

"What of the Contractor" has left us wondering what it is aiming at, and for whom it is speaking. It recalled to mind your highly instructive and interesting article of March 11, 1933, "Profits on Current Business," in which you dispassionately analyzed the situation and pointed the way to methods of selling and distribution.

Your article of April 29, 1933, on "Retailing for Profits" aroused our hopes that here at last was a man unafraid to speak the truth, no matter whom it hurt. Your desire to introduce rhyme and reason into the electrical industry was very evident and heartening indeed. In your article you spoke our language, in no uncertain way. That article described truthfully conditions as they existed and still exist, and you justly attributed to those conditions as the true causes of killing the contractor's initiative for selling electrical products. You went on to suggest practical and sound remedies in the method of distribution.

As if to follow up your suggestions of April, where, in justice and fairness to all, you pointed to the necessity of due recognition of the electrical contractor, the electrical contractor's Code of Ethics, as submitted in Washington, reads:

> The electrical contracting industry recognizes that the most economical method of distribution in the interests of both the consumer and the industry is from manufacturer to wholesaler to contractor. Therefore, provisional upon the adoption of a reciprocal system by recognized wholesalers, the members of the industry agree to purchase all of their electrical products from recognized wholesalers, when and if the products required are available from such recognized wholesalers.

This is in line with your thoughts and it is an honest and sincere desire on the part of the contractors to put our house in order in the true spirit of the New Deal.

Yet, in your November article of the same year, you

ask, "What of the Contractor?" and in it we find not a trace of the Morrow of April, 1933. Certainly you know, Mr. Morrow, that the very same abuses are still being practised on the contractor, and today, because of the New Deal, and because of the government's clear definition* of the "retail trade," is defined in the retail code, these abuses of selling all kinds of electrical products retail, at wholesale prices, are glaring, flagrant violations of any code of ethics.

Why electrical products must be sold to so many different classes of customers at wholesale prices, to which they were never entitled, still remains a fundamental, unanswered question. Because of direct sales, electrical contracts too often stop with the mere installation of feeds. Equipment, switchboards, etc., are installed by the owners. Yet the plumbing and heating contracts do not stop with the installation of feeds. Boilers, radiators, bathrooms, etc., are not fitted out by the owners. You have recognized these facts before. Why not point to them again in your "What of the Contractor"? An injustice remains such until it is eradicated, we believe. Since the National Recovery Administration, this subject must be solved more than ever.

We are not taking issue with you for criticising the contractor. We are the last ones to claim that we are above just and constructive criticism. In any dispassionate analysis of the electrical industry, we feel, however, that we have been decidedly more sinned against than sinning.

The National Electrical Contractors Association, of which Mr. Mayer is president, has time and again sincerely attempted to introduce rhyme and reason into the distribution of electrical products—not alone for the contractor's sake, but we are convinced, as you so often have brilliantly pointed out in your analyses, that there seems to be no distribution method at all in the electrical industry and that neither manufacturers, jobbers, nor contractors have anything to show for their efforts.

As to whether the contractor belongs to the electrical construction industry is entirely immaterial to us as business men or "tradesmen," as you call us. The fact is that we do sell electrical materials and equipment. The fact is that every time we do a job electrical material is sold and some manufacturer gets an order out of it. Why these manufacturers should expect the contractors to continue selling materials of any manufacturers who are in active competition with them is hard to understand. We mean that every time a manufacturer or wholesaler sells our customers at our price or better they are our competitors.

You state: "Mr. Mayer presented adequately and clearly the viewpoint of the electrical contractor as a tradesman, but of the contractor as a business man laying plans to develop and sell a market, Mr. Mayer said nothing at all." Will you please explain this difference between tradesman and business man? And who, pray, are these great visionaries in the electrical business who are laying plans to sell a market?

Reinspection work is as much our market as any other electrical work. Mr. Mayer stated our position clearly and definitely before the International Association of Electrical Inspectors. We do want a Safety Code, which will be more specific, more concrete, more definite and more detailed. We believe that the Safety Code is very important and should be adhered to.

What do you suggest, Mr. Morrow, no code, no restrictions, free rein to the same competitive, destructive force which has almost driven all business to the dogs? Let everybody and anybody sell anything or in any way they please, as long as there are sales and more sales? Let manufacturers sell their articles through the 5-and-10-cent stores, by just changing their trade name and yet charge the trade twice as much for the same articles? Is that your idea of promotional, enterprising business men? Perhaps we have failed to see wherein is the logic of your attack on the contractors?

As to Mr. Wellman's article, "The Inspector Looks at the Contractor," of course Mr. Wellman is entitled to his opinion on any subject, including the contractor, but when a man in his position as engineer of the Louisiana Rating and Fire Prevention Bureau goes on to state that to enforce the making of alterations and repairs in accordance with reinspection requirements creates distrust and suspicion in the minds of users of electricity, he makes the statement that the Safety Codes are not worth the paper on which they are written.

We, the electrical contractors, however, believe that Safety Codes were primarily written for the safety of life and property, and if such is the case electrical installations should be brought up to par, as the codes are improved upon and more safety measures introduced. The test of a real safety code is not the cost, but its safety. Is the contractor wrong in this reasoning?

Mr. Wellman's argument, it seems to the contractor, is definitely against the Safety Code and not against us. Will Mr. Wellman explain just what he means, "Will the contractor take advantage of the opportunity offered and educate the user of electric current"? Just what does he mean by that? It's a nice-sounding phrase, that's all—a refuge for most utility orators. As to his claims that the average contractor does not even take a passive interest in educating himself toward proficiency in his profession, is he not more interested in job sheets, price lists, overhead, etc., than he is in becoming a competent installer of electrical materials and devices? Any contractor who is interested in price lists, job sheets, overhead, etc., in order to have existed during these last few years certainly had to be proficient in his profession.

Mr. Wellman is correct in his statement that the contractor needs helps from the other branches, but so do the other branches of our industry need the help of the contractor.

The reopening of this discussion of the "Contractor in the Electrical Industry" is very timely and here is hoping it will be helpful in solving this much crying problem in the spirit of Mr. Morrow of April, 1933. We are with you for sound and economic principles in the electrical distribution system, which also must include equitable compensation for the contractor for services rendered. If the contractor fails then to do his part, then and only then should he be ostracized.

Often the simple question comes to mind: Does the electrical industry realize that the contractors are, as a rule, intelligent, hard-working salesmen for the industry, paying their own way? But do not expect them to go broke altogether doing it. That's the problem reduced to plain English.

MORRIS NEWMARK,
Chairman Trade Relations Committee.
Philadelphia Electrical Contractors Association.

*"*The term retail trade as used herein shall mean all selling of merchandise to the consumer and not for the purpose of resale in any form.*"

BOOK REVIEWS

The Preparation and Prosecution of Patent Applications

By Charles W. Rivise. Published by the Michie Company, Charlottesville, Va. 437 pages.

Emanating even though it does from a patent attorney and a law publishing house, this book has as much value for either the first-time inventor or the prolific one and their business backers as it has for the patent attorney and the examiner. Every stage in the meticulous process from the conception of the idea to a possible appeal to the U. S. Supreme Court for patent justice is covered in the book. Especially noteworthy is the success attending the author's effort to translate the intricacies of fine patent law distinctions into language intelligible to the layman. The layman will also see why "or" is too loose a word to use more than once or twice in his application and why "means whereby" is more significant than it looks.

Naturally in so highly technical a subject numerous case citations will make explication easy and tangible. But each citation here serves a specific purpose and is not included (as seems to the layman in so many legal treatises and even decisions) just for the sake of establishing a formidable glossary.

Every electrical engineer at least once in his life will succumb to a bright idea. If he has read this book he will see clearly that the patent procedure was not deliberately devised by a capricious government to keep him by infinite intricacy from deriving the fruits of his brainchild, but rather to keep others from unjustly depriving him of them. This is not a book on what to invent. It is a book telling how to get a worth-while patent and thus protect the inventor against all encroachment.

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Electrical Circuits and Machinery

By J. H. Morecroft and F. W. Hehre. Published by John Wiley & Sons, Inc., New York. Vol. II., Third Edition. 582 pages, illustrated. Price, $4.50.

This is a text book on alternating currents and machinery and this edition has expanded the treatment of machines and transformers. More and new material on generators, motors, rectifiers and tubes bring it up to date. Mathematics, good illustrations, examples and descriptive material make this book a thoroughly comprehensive and teachable text for engineering students. It treats of vectors, circuits, transformers, generators, polyphase and single-phase circuits, motors, rectifying devices, meters and power transmission in well-written chapters.

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Geschichtstafeln der Elektrotechnik

(Historical tables)

By Sigwart Ruppel. Published by Verband Deutscher Elektrotechniker, Berlin-Charlottenburg 4, Bismarckstrasse 33. 127 pages, 8 x 11¾ inches, illustrated.

This compilation of several thousand dates, conveniently classified, of physical discoveries, of inventions and of the introduction of devices, appliances and equipment should serve as a valuable work of reference on the history of applied electricity. References are almost exclusively to German technology. This is a weakness, but to go farther would involve countless controversies as to international priority. Of these the solution must await similar painstaking searches in other countries.

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Electrical Engineering Practice

By J. W. Meares and R. E. Neale. Published by Chapman & Hall, Ltd., 11 Henrietta Street, Convent Garden, London, England. Vol. III. 1,060 pages, illustrated. Price, 30 shillings net.

This is a handbook for electrical, civil and mechanical engineers. It uses descriptive matter, tables and illustrations to cover motors, motor controls and motor drives. Principles of operation, characteristics, connection diagrams and illustrative applications are given. The book is elementary in technical treatment and non-mathematical, but covers the chosen realm very adequately.

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Elements of Heat Power Engineering

By W. N. Barnard, F. O. Ellenwood and C. F. Hirshfeld. Published by John Wiley & Sons, Inc., New York.

Part II. 871 pages, illustrated. Price, $5.50.

This well-known text has been completely rewritten and this volume covers steam-generating apparatus and prime movers, fuels, combustion and heat transmission. The thorough and fundamental treatment makes this an outstanding text book as well as an authoritative source of information by practicing engineers. While technical in large measure, splendid illustrations and descriptive matter tie theory to practice.

Part III. 520 pages, illustrated. Price, $4.50.

A thorough treatment of auxiliary equipment, assembly of power stations, air conditioning and refrigeration is given in this volume of this well-known text. It has been completely rewritten and expanded. A very splendid treatment is given of power station economics and the added information on air conditioning and refrigeration should enhance the value of the book for students and engineers. A happy combination of theory and practice makes this series an outstanding authority on the subjects treated.

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Reseaux de Distribution D'Energie Electrique

Systems of Distribution of Electrical Energy

By A. Curchod. Published by Dunod, 92, Rue Bonaparte (VI) Paris, France. 655 pages, illustrated.

Two preceding volumes cover electricity and magnetism and electrical machinery. This third volume deals with the assembly of generating plants, lines, substations and feeders to constitute an integrated system of supply. Inclusion of protection against all types of abnormal conditions, corona, catenaries, stubbing, cable joints, interior wiring, cellular stations, steam accumulators, run-off determination, dam design, rate principles, etc., attest the comprehensiveness of the treatment crowded into 500 pages. In short, it contains an excellent portrayal of world-wide practices in system design, assembly and co-ordinated functioning. Throughout there are bibliographies on all significant evolutionary topics and many of the references are to American literature.

Men of the Industry

J. A. Walls New President of Pennsylvania Utility

John A. Walls, one of the leading hydro-electric engineers of the country, was elected president of the Pennsylvania Water & Power Company and president of the Safe Harbor Water Power Corporation, to fill the vacancies caused by

the death of Charles E. F. Clarke, at meetings of the boards of these companies held last week. Mr. Walls has been vice-president and chief engineer of the Pennsylvania Water & Power Company since 1914 and of the Safe Harbor company since its organization. He has been the chief engineer of Pennsylvania Water & Power Company since its founding in 1910 and has been continuously associated with the developments of the water power of the Susquehanna basin at Holtwood and Safe Harbor, Pa. He was born in Lewisburg, Pa., and is an alumnus of the Massachusetts Institute of Technology.

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J. L. RINTOUL, who has been treasurer of the Pennsylvania Water & Power Company since 1917 and associated with it since 1910, was elected a vice-president of that company.

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F. A. ALLNER, general superintendent of the Pennsylvania Water & Power Company, who has been associated with it since its organization, was elected a vice-president of that company.

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C. T. MESS, assistant engineer of the California State Railroad Commission, has been appointed valuation engineer of that organization.

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MARVIN E. BUSHONG of Lancaster, Pa., who has been a director of the Pennsylvania Water & Power Company since 1924 and a director of the Safe Harbor Water Power Corporation since it was formed, was elected a vice-president of the Safe Harbor Water Power Corporation.

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H. N. PYE, chief engineer Southeastern Underwriters Association, has been elected a member of the executive council of the International Association of Electrical Inspectors. Mr. Pye also is a member of the national electrical code standards committee of this organization.

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N. E. CANNADY, state electrical engineer, State of North Carolina Insurance Department, Raleigh, has been elected a member of the executive council of the International Association of Electrical Inspectors. Mr. Cannady also is chairman of the national electrical code standards committee of this organization.

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STORRS M. BISHOP, formerly identified with the New York Power & Light Corporation at Glens Falls, has been appointed resident manager of the Port Henry district. Mr. Bishop has been associated with the company since 1926.

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PIERRE VINET, for the past several years commercial manager of the Coast Counties Gas & Electric Company, Santa Cruz, Calif., has been made district manager at Pittsburg. Before becoming identified with the California utility, Mr. Vinet had served as a commercial executive in various Doherty properties in the Middle West.

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New Equipment Available

Pole Top Type Oil Circuit Breaker

Moderate capacity oil circuit breaker for outdoor distribution service suitable for mounting either on pole or framework has been announced by the Condit Electrical Manufacturing Corporation, Boston, Mass. This breaker, designated as type P-50, is furnished full automatic or non-automatic, manually or electrically operated, for 200 and 400 amp. for two, three and four pole, single throw and full automatic or non-automatic manually operated two and three pole, double throw, with or without interlocks.

Some of the features of this breaker are: Insulation characteristics considerably in excess of A.I.E.E. requirements, sturdy weatherproof construction, with all joints gasketed and stuffing box for handle connection, provision for inspection of contacts without necessity of entirely removing tanks, etc.

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LIMITORQUE VALVE OPERATOR, the control of which consists of a self-contained reducing gear unit with mechanical and electrical limit built into the mechanism, has been announced by the Philadelphia Gear Works. The valve-operating nut that raises and lowers the valve disk is incorporated in the casing and is supported by heavy-duty Timken roller bearings.

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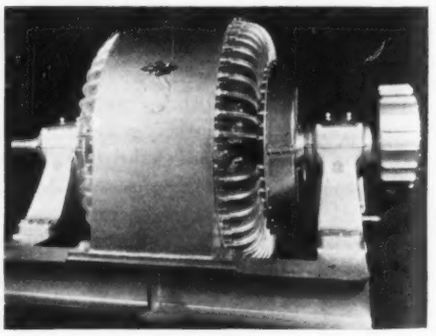
HUMIDIFYING ATTACHMENT for existing radiators on either steam or hot water systems, known as the "Arco" humidifier "A," has been placed on the market by the American Radiator Company, New York. This attachment is fastened to the end of the radiator so that the heating medium (either steam or hot water) flows through a coil immersed in water, bringing the water near the boiling point and causing constant vaporization.

▼

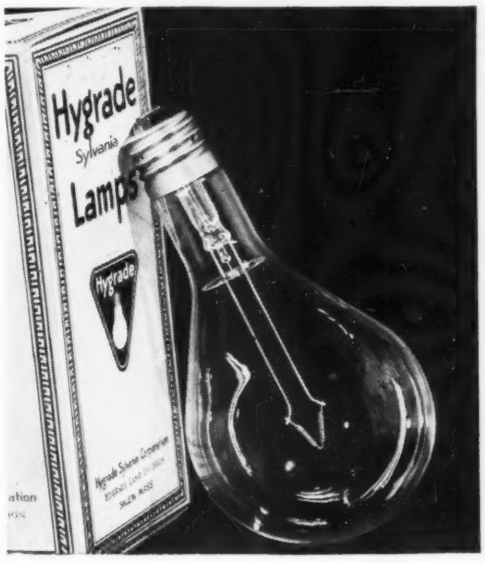
Motor Designed for Use in Corrosive Atmospheres

A totally inclosed, fan-cooled synchronous motor designed for use in locations where corrosive atmospheres prevail, or where motors are subject to salt-water or other sprays, has been



announced by the Electric Machinery Manufacturing Company, Minneapolis, Minn. Working parts of the motor are totally inclosed and sealed from exterior atmosphere. Motor cooling is secured by internal recirculation of air. These synchronous motors are available in practically any horsepower or speed rating to meet any kind of corrosive atmospheric condition.

Hygrade street series Lamps are worth investigating



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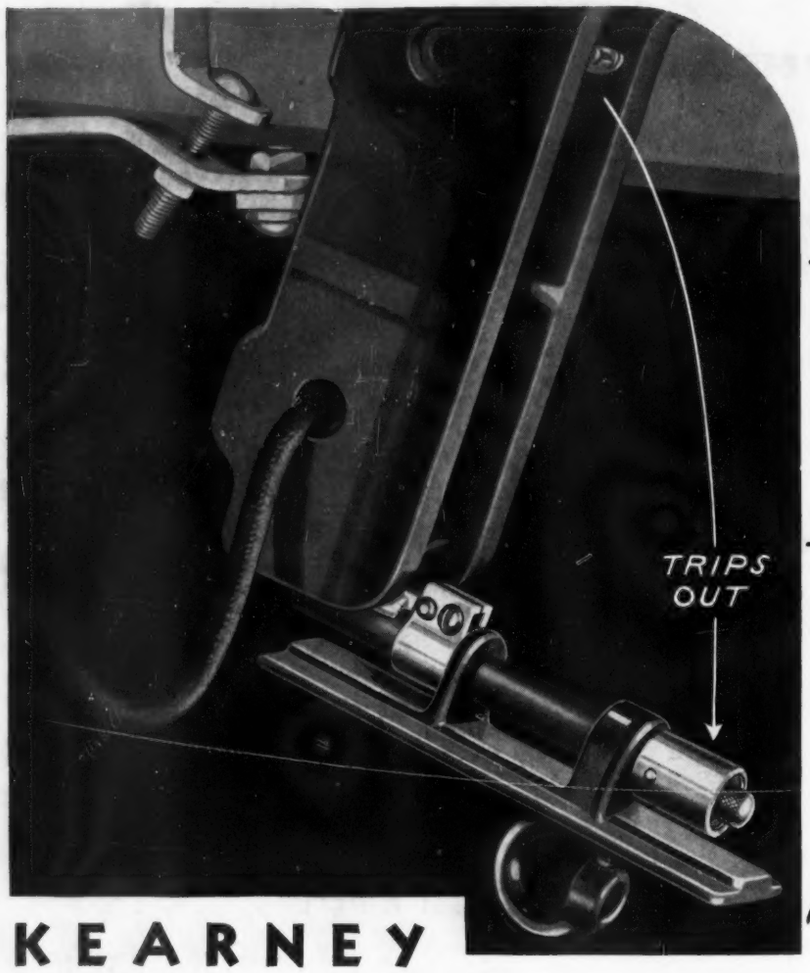

CONSISTENT

Performance

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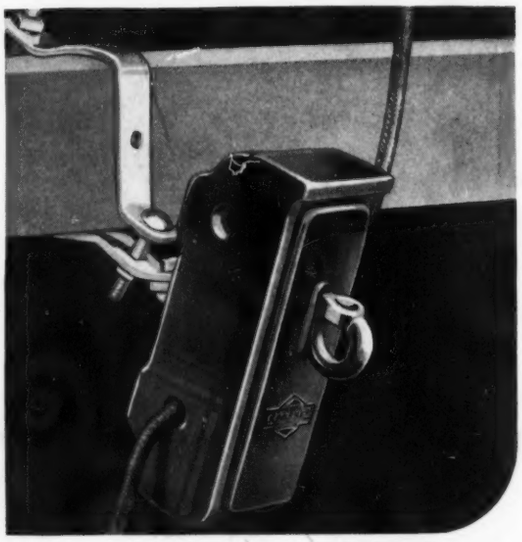
KEARNEY TRIPOMATIC CUTOUTS

CONSISTENCY of operation is the keynote of the success that the Kearney Tripomatic Fuse Cutout has enjoyed in the field. Operators rely implicitly upon this Cutout to protect line equipment against overload and short circuit faults. The circuit is not only cleared, but the point pressure contacts are separated by a substantial air gap and the cartridge door is open to indicate a fault condition.

No cartridge burn-outs, point pressure contacts, pressed cast porcelain housing, standard outdoor type fibre fuse tube and swivel hanger are some of the features of Kearney Tripomatic Cutouts.



Kearney Tripomatic Cutouts are made for 5000 and 7500/12500 Y Grd. volts, 60 ampere operation. Complete data and price information will be gladly sent on request

KEARNEY PRODUCTS

Screw Anchors; Expansion Anchors; Guy Wire Clips and Strand Bands; Solderless Con-nec-tites; Double Duty Cutouts; Tripomatic Porcelain Housed Fuse Cutouts; Economy Cable Clamps; Dead-End Service Clamps; Fuses; Fuse Link Boxes; Fuse Pullers; Pole Top and Quick Break Gang Operated Switches; Lox-Round Guy Guards; Hitemeters; "Jay" Hooks; Conduit Straps; Pole Stubbing Seat; ABC Sleeves; Cable Ring Saddles; Sleeve Twisters; One and Two Insulator Fuse and Disconnect Switches; Trip Out Switches; Porcelain Housed Disconnect Switch; Live Line Tools and Accessories; Live Line Tap-Off Clamps; Grounding Sets; Underground Boxes; Ground Wire Clips; Ground Rod Connectors; Grounding Cable; Secondary Fuse Holders; Telephone Drop Wire Ties . . .

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